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Improvement in Wood-working Machinery.

GROSVENOR'S IMPROVED VARIETY MOLDING MACHINE.

Before the invention of wood-molding machinery for curved work—which dates back only about fifteen years—the labor of producing moldings on curves by hand was very great, so great that this style of ornamentation was rarely used. The Woodworth planing machine and the ordinary wood-turning lathe are undoubtedly the originals from which the simple planing and molding machines for sash and door makers proceeded, and these, combined with the lathe for turning irregular forms, contain the principles of the variety molding machine. Since the first inception of the machine, however, a number of important improvements have been made, being embraced in no less than nine patents.

Fig. 1 is a perspective view of the machine for cutting moldings of any desired pattern, on curves, regular or irregular, and of any radii required. There are two upright cutter heads projecting above the top or table of the machine, driven by belts on flanged pulleys or drums, from a counter shaft, provided, as usual, with fast and loose pulley. Instead of raising or lowering the table to adjust the work to the cutters, as is generally done, the cutter heads and their shafts, boxes, and pulleys, with a frame in which all are held, are raised and lowered by means of a screw, gear, and a pinion on an up-right shaft, to each cutter head, so that one works independently of the other. The upright shaft, carrying the pinion at its lower end—that gives motion to the gear and screw directly under the cutter-head frame—has a bevel gear on its upper end connecting with a similar gear on a horizontal shaft under the table, provided at its outer end with a hand wheel conveniently situated for the hand of the operator even when he is intently engaged in guiding the stuff to be cut.

Fig. 1

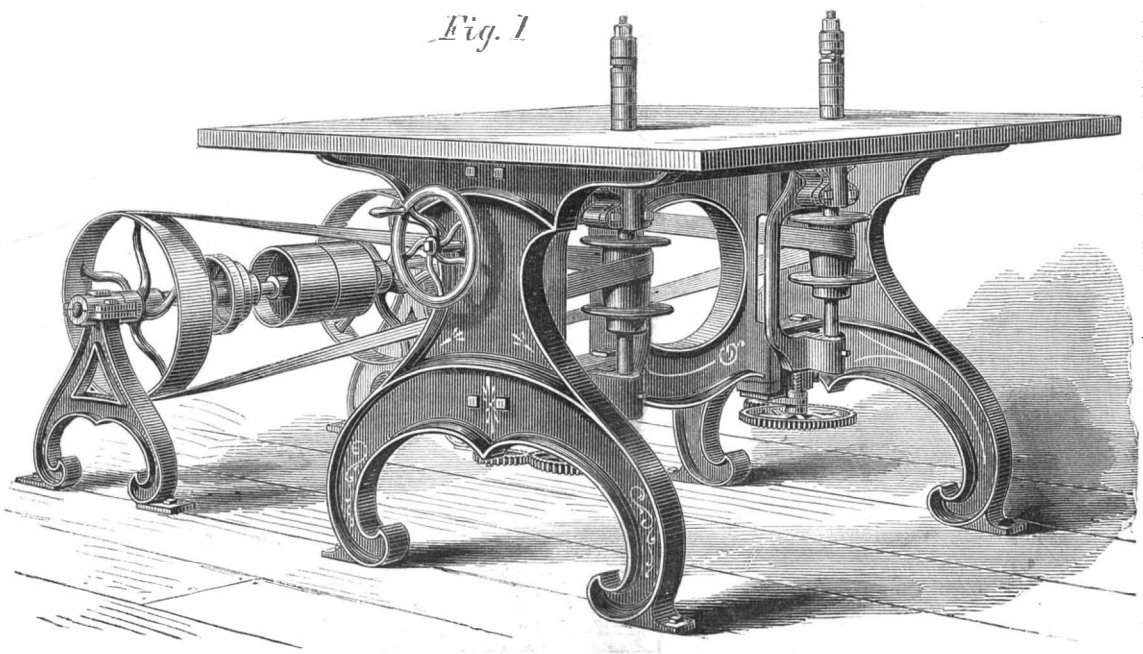
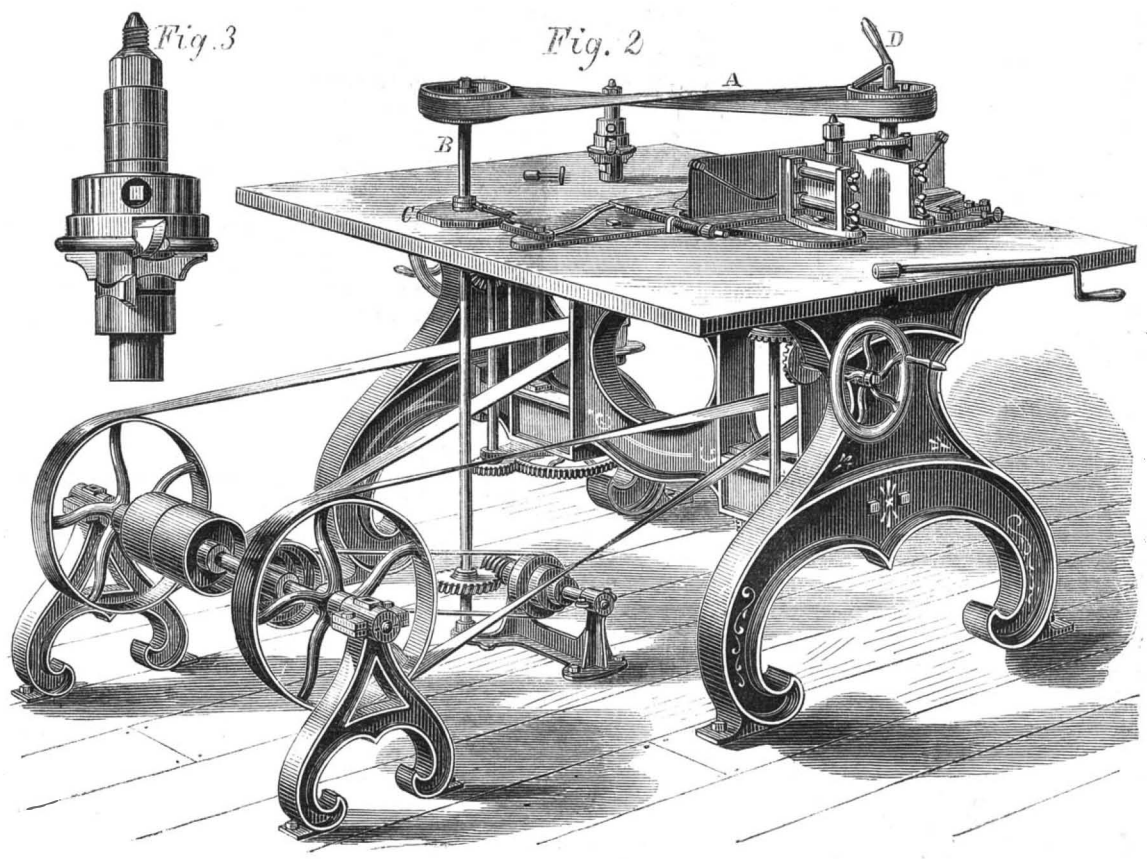


Fig. 2 is the same machine as Fig. 1 with the addition of a guide for cutting either straight or waved moldings. The guide is a plate which is held to the table top by two bolts for straight moldings. The guide is adjusted by means of horizontal screws at either end and held by set screws. The stock to be cut is fed between the guide and cutter-head by a roller on an upright shaft receiving motion by means of a belt, A, from a similar vertical shaft, B, that is driven by a belt from the counter shaft. This belt is taken from a cone on the counter to a similar cone to allow a change of feed. The shaft of the latter carries a worm that revolves the shaft, B, and consequently the feed roller. Buffers or spring guides, against which the stuff to be cut impinges in its passage, hold it well up to the vertical guide.

Fig. 3

Fig. 2



For waved molding the guide plate or platen on the table is pivoted at the forward end and held by a spiral or rubber spring, or by a weight at the other end to the ledge of a cam, C, on the shaft, B, which may be of any form desired to produce variations of the waved form. D is a shipper handle to stop or start the feed. This whole appurtenance is easily removed leaving the machine clear for irregular work as in Fig. 1, and may be as easily replaced in a moment.

Fig. 3 is an enlarged view of the cutter head used on both these machines. It is a combination of cutter head and rotary plane stock. Cylindrical flanges project downward from a disk or collar fitting the head stock and secured by set screws. These dished collars may be made of different sizes to suit the varying projections of the cutters from the head. In doing irregular work, where it is necessary to hold the stuff by hand to the cutter head, there has been danger of mutilating the hands by a sudden and undue action of the cutter upon the stuff in starting into the work. This has been a serious objection to other machines which this improved machine for irregular work has entirely obviated, it being impossible for an accident of this kind to occur. With this cutter head six or more cutters may be used at once to form a single molding; these may be transposed, producing over thirty different forms with the same cutters, at a great saving of time and labor. The cutters may be set at such an angle that they may cut against the grain without splitting the wood.

The machine is well adapted for moldings, brackets, lattice work, etc., for house finishing. It is especially adapted to the furniture and cabinet maker; carriage builders, agricultural implement makers, pattern makers, car builders, boat makers, and workers in many other mechanical branches will find it a great assistance in the different departments of their business.

All letters and orders for machines should be addressed to the Combination Molding and Planing Machine Company, No. 424 East Twenty-third street, New York.

Grape Shot.

"We have to record the demise of a distinguished and well-tried servant of the public, one of the very oldest members of the artillery service. Grape shot is no more. Who shall say when the career of this ancient projectile commenced? It was probably contemporary, or nearly so, with the introduction of artillery; for, without too nicely specifying particular patterns it may be said to have had its origin in the charges of old nails, coarse gravel, bits of iron, bolts, and the like, which, under the comprehensive term of "longridge," were used by artillerists as early as the fourteenth century. The little bags filled with stones of this epoch, and the canvas cartridges containing small iron balls, of a later time, furnish more exact prototypes of the modern form of grape, which consisted of an iron plate and spindle, piled round with iron balls enclosed in a canvas bag, the whole being "quilted" with a strong line and painted. The name "grape" was derived from the sort of rude resemblance which this projectile bore to a bunch of grapes. Outside the service, this is the form of grape best known; but, strictly speaking, it was superseded forty-six years ago by a description of grape known as "Caffin's pattern, after its inventor. The Caffin's grape, although approved in 1822, was not generally made until 1856, and it never quite shouldered the old-fashioned sort out of service, for to this day there exist at most stations stores of the latter, the greater part of these stores no doubt in an unservicable condition. The Caffin's grape consisted of four tiers of circular iron plates, inclosing between them iron balls, and connected by an iron spindle which is passed through the centres of the plates. The old-fashioned grape never got over the shock inflicted by the introduction of this new pattern, and of late years its identity has become merged in great measure in case or "canister" shot, cylinders of tin or iron filled with balls. By increasing the size of these balls, and by improving the construction of cylinders themselves, a projectile, which was first known as "case-grape" was made to do duty at once for case and grape; and a recent order has removed the old grape shot from the list of British service stores. So distinguished a servant cannot, however, be allowed to take its departure, to mingle its ashes with those of the chain and bar shot of earlier ages, without a word, if not a tear, of regret. Its glory has been great in its day. Many and many a fine fellow has gone down before its fierce blows; many a breach has been swept by its whistling showers; the torn and shattered riggings of many a hostile ship have borne eloquent testimony to its destructive powers. But it is now among the things which have been improved off the face of the earth—off this English earth of ours at least. Among the changes and developments of modern artillery science it has found its rest. Grape shot, *pur et simple*, grape as the sailors of Nelson's day and the soldiers of Wellington knew it, is no more. A sort of hybrid projectile, a little more of case and less than grape, a projectile of superior destructive and more enduring powers, will henceforth take its place, and satisfy the requirements of a more critical age."—*London Pall Mall Gazette.*

The above may mislead inquirers. Whatever may be the orders of the British Admiralty or the ideas of the *Pall Mall Gazette*, it is certain that grape shot is not yet driven from our Yankee gun provender. It did efficient service in our late war and is good for similar service in future wars, unless we invent something more destructive for action at close quarters. We do not use "four tiers of iron circular plates, enclosing between them iron balls, and connected by an iron spindle which is passed through the centres of the plates." Our style of grape shot is simply two plates, suited to the bore of the gun, held apart by a coiled rod of iron wire, one-quarter of an inch in diameter, the coils being close enough to hold the balls—of one and a half inches diameter—the two heads of the cylinder guiding the charge into the gun, but by the force of the explosion flying apart and releasing the balls on the

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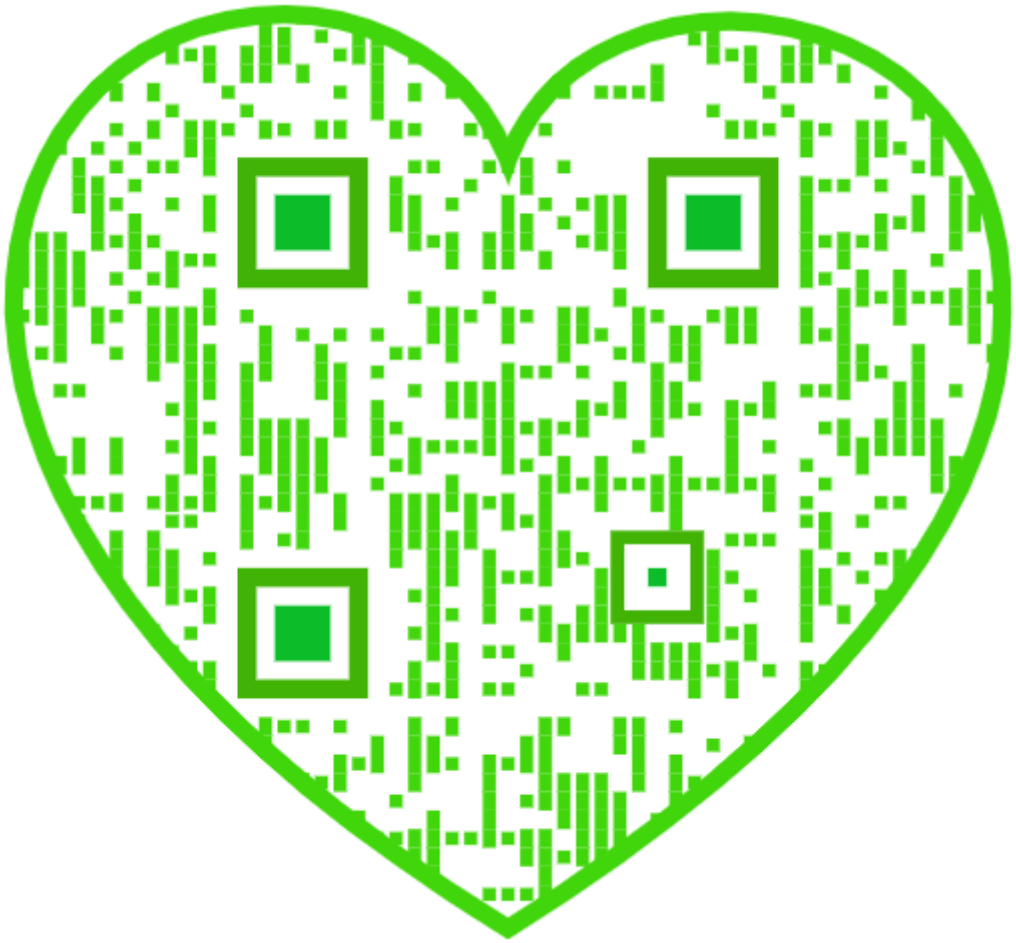

discharge of the gun. If our English cousins choose to dispense with the grape shot, we do not. It has served us too well to be rejected, until something better is contrived. Does the "case-grape" of the *Gazette* fulfill the conditions required?

SCIENTIFIC OBSERVATIONS ON THE SUPPLY AND OUTFLOW OF THE NORTHWESTERN LAKES---THE METER AND METHOD OF USING IT---RESULTS OF THE OBSERVATIONS.

From the Detroit Post.

It is now about two years since the newspapers of the West began to discuss whether the great lakes are fed by subaqueous springs or have hidden outlets. The parties who favored the theory of subaqueous springs, asserted that more water flowed out the St. Lawrence than could be poured in by all of the sources of supply known to exist; while the upholders of the idea of hidden outlets contended that evaporation and the visible outflow could not account for all the water which the lakes received and distributed. Both sides found encouragement for their views, in the fact of the periodic rising and falling of the waters in the lakes; in that of the occasional sudden and rapid increase and decrease from the mean level of the waters; and in other phenomena which had been observed to exist. However, no one had given the matter a complete investigation, although it was one of some scientific as well as popular interest. General W. F. Raynolds, Superintendent of the Lake Survey, determined to give the subject such consideration as, in the West, could only be afforded by the engineers employed on that work, and accordingly, for the past two summers, observations have been made in the Ste. Marie's, St. Clair, Detroit, Niagara, and St Lawrence Rivers for the purpose of ascertaining the exact amount of outflow of the lakes. These observations will also and in fixing the general laws of flowing bodies, a subject in which the owner of every mill, or other machinery, which is driven by water-power, is directly interested. The observations already made, tend to unsettle some of the theories heretofore received. The apparatus used is so much more perfect and delicate than anything else of its kind that the results are of great value.

The river gaging has from the start, been intrusted to Assistant D. Farrand Henry, of this city, who has succeeded well in his task. During the summer just past, he had three parties, under Assistants Lewis Foote, A. R. Flint, and Mr. Wallace, stationed at Fort Niagara, Ogdensburgh, and St. Clair.

The implements used are peculiar to the work, and were invented by Assistant Henry. The result of his observations, and the method pursued in making them, will be interesting to the public.

To calculate the amount of outflow of any stream, it is necessary to have the area of the body of water, and its mean velocity, at any point. These two quantities multiplied together give the discharge. The first is easily obtained by making frequent soundings across the stream on a known line. The second is more difficult. The only practical methods heretofore in use, for the determination of the velocity are, first, by the time of passage of floats past a known line; second, by the difference in the hight in which water will stand in two tubes, one of which is bent toward the current at the bottom and the other is straight; and, third, by water-mills, as they are termed, which consist of float wheels exposed to the current, the number of revolutions being recorded by a system of decimal gears or telltale. Of these methods, the first is the only one which has been used in deep water.

During the first season Assistant Henry adopted the first method, using the double floats used by Generals A. A. Humphery and A. L. Abbott, of the Corps of Engineers, in their hydraulic survey of the Mississippi River. Being dissatisfied with the results then obtained, he devised a "Telegraphic Current Meter," which he has successfully used in the several rivers connecting the lakes during the past season.

DESCRIPTION OF THE METER.

This consists of a propeller or float wheel, which has on its hub an eccentric, and on the axle an ivory lever, which has one end kept on the excentric by a light spring, while into the other end a hole is drilled, meeting another hole, drilled at an angle with it, near the center of the bottom side. Into these holes a platinum wire is forced, so that the lever rests on the point of the wire coming out of the center hole. Under this point a small platinum plate is fastened to the axle. The other end of the wire is connected by a hinge joint to a long copper wire, which is fastened to the axle, but insulated from it. At the rear of the axle are two vanes, at right angles to each other, sufficiently large to keep the wheel in the thread of the current. The whole is suspended by a yoke which has two small eyes on its side.

THE METHOD OF USING.

The method of using the meter is as follows: A boat being anchored in the stream at the point where the current is to be tested, a weight with a copper wire attached is let down from the stern. The upper end of this wire is fastened to a spring pole, which takes up most of the motion of the boat. This wire is passed through the eyes on the side of the yoke in the meter, a measured cord is fastened to a swivel ring in the upper, and a weight to one in the lower end of the yoke. The meter may now be lowered to any depth, sliding down the anchored wire, and the upper end of this wire and of that are fastened together with the platinum point, being connected with a battery in the boat, then at every revolution of the wheel the circuit will be opened and closed by the eccentric, raising the ivory lever, and thus breaking the connection between the platinum point and plate. If now a Morse's paper register be placed in the circuit, at ever revolution of the wheel a dot will be made on the moving paper, and thus the number of revolutions in any given time can be ascertained. For some determinations the Morse register was used, but on account of the amount of paper required, and the labor of counting the dots, the "counter" was generally preferred. This consists of a sounder register, in front of which a frame is fastened, carrying two gear wheels of 100 teeth each, the rear wheel having on its axle a ten-leaved pinion, with which the forward one engaged. On an extension or the armature lever is an ordinary escapement reaching a little past the center of the rear wheel, and wide enough to allow it to move freely when the armature is at the middle of its movement. The pallets engage the teeth of the wheel in such a manner, that the wheel is drawn forward one tooth each time the armature is drawn down and released, and, therefore, at each revolution of the wheel. Thus the meter can be raised and lowered on the anchored wire, can be allowed to run for any length of time at one place, and the counter can be stopped or started at any moment by a simple switch.

RESULTS OF THE OBSERVATIONS.

The observations in the river were taken on a known line, 100 feet apart, and at each five feet of depth. One of the first things noticed, was the irregularity of the beat of the counter, showing that the current pulsated. This has since been found to be the case in canals, mill races, streams, wherever it has been possible to place the meter, and it seems to be a general law of water in motion. This instability of the current had been previously noticed by Mr. James B. Francis, civil engineer, of the Lowell Hydraulic Works, in the irregular motion of floats.

The pulsations are not regular, the common maximums being from one-half to one and a half minutes apart, with every five or ten minutes a greater increase or decrease. They are least in the maximum current, and increase toward the bottom and sides of the stream.

The observations give the number of revolutions of the meter, but not the actual velocity of the current. To obtain this the coefficient of each meter, or the number by which the revolutions must be multiplied to obtain the true velocity, must be found. This can be ascertained by letting the meters run in a current of a known velocity, or by drawing them through still water. The first method being impracticable, the second was used.

Two of the meters were fastened below a small boat, which was drawn at different velocities, over a known distance in a quiet pond. It was found that the number of revolutions increased with the increase of the velocity.

One of the meters was made by taking the hemispherical cups of a Robinson's Anemometer, made by James Green, and running them in a frame upon two steel points. There was so little friction that the meter would turn in a current of a little over two-tenths of a foot, a second, or one seventh of a mile an hour. D'Aubuison gives the ratio of the resistance of plane surface, to that of a hemisphere drawn through still water to be as 100 to 35, and from this the co-efficient of three used in Robinson's Anemometer is taken. But these experiments show that when the velocity is half a foot a second, the ratio is 100 to 29 nearly, and at four and a half feet per second as 100 to a little more than 41; the mean being about the same as that given above. These quantities do not, however, increase in a direct ratio, but nearly in the curve of a parabola, so that in velocities exceeding three miles per hour, the coefficient should be from two and a half to two. This is an important fact for these meteorologists who are using this instrument for the determination of the velocity of the wind. This coefficient being thus found for each velocity, it is only necessary to multiply the number of revolutions by it to obtain the true velocity of the current.

Assistant Henry is at present engaged in running all the meters used together in the river here, to obtain the coefficient of each machine by comparison with those whose coefficient has already been obtained in the manner above stated.

The maximum velocity of the current was found to be at or a little below the surface, and the velocity at the bottom is probably not over two-thirds the maximum.

The following approximate velocities and discharges of the different rivers is taken from the computations of the work last year. The quantities for the Detroit River are computed.

River.	Maximum velocity.		Mean velocity		Disch'ge cubic feet per second.
	Ft. per second.	Miles per h'r	Ft. per second.	Miles per h'r	
Ste. Marie's.....	1.921	1.30	0.967	0.66	90,783
St. Clair.....	4.544	3.09	3.514	2.39	233,726
Detroit.....	4.000	2.71	3.000	2.04	236,000
Niagara.....	3.370	2.32	2.258	1.54	242 494
St. Lawrence.....	1.462	1.00	0.954	0.65	319,943

THE MANUFACTURE OF ARMS IN PERSIA.

FABRICATION OF GUNS.

The manufacture of arms has always been one of the principal industries of Persia. The muskets of the old and celebrated manufacturer Mustapha, are still worth from $400 to $500 each, and all armorers follow the same methods which have been used by thisf amous master For the making of a gun, two old horseshoes are taken together with small pieces of old iron, so that the whole weighs nearly fifteen *sirs*, which is not quite two pounds. In the heating the small pieces are arranged in such a manner that the horseshoes form the outer rim. When a proper degree of softness has been attained they are welded on an anvil. This process is repeated for several times until the iron obtains a length of two feet and a quarter. When twelve such bars are obtained, they are bound together and then welded; the bar obtained is cut in pieces of such a size that four or six will form the desired weapon. These bars are then twisted and welded together, the resulting piece is afterward bent and again welded to one bar which finally is turned and bored.

If the barrel proves satisfactory it is polished in order that the various twist marks may appear, which are produced by the different qualities of iron. It is afterward coated with a paste of two parts of sublimed sulphur and one part of sea salt, and left for twenty-four hours in a warm room, and being cleansed is then ready for sale. The price of a rifle as made now-a-days varies from $40 to $80, and that of a pistol from $18 to $40. These guns generally possess locks but often they are also fired by a fuse. In the southern part of Persia we find the infantry armed with such weapons. Their chief manufacturing place is Laar. This weapon is partly supported by a kind of fork which is fastened at the extremity of the barrel. The percussion guns are exclusively of European manufacture, the best of which are considered to be made in England, which can only be bought by the nobles. The common classes satisfy themselves with the products of native or Belgian art.

The Persians are good target shooters, and very fair sports men so far as ordinary shooting is concerned, but they are very poor on the wing.

THE MAKING OF DAMASK STEEL.

The blank weapons consist either of damask, ordinary steel, or iron, of which the smelting of the first is an industry peculiar to Persia. There exist various kinds of damask which we propose to describe as follows:

1. *The Indian damask.* It is made at Lucknow. All the workmen are Persians, one of the manufacturers being known from antiquity. His name is Mirza Hussein Chirazi. The said damask consists of three parts silicate of iron, one part cast iron, and two parts very pure iron. These substances are put in crucibles which contain five to forty *miskals* (25 to 200 grammes); the latter are then set in a furnace and kept therein for six days at a strong heat. Such furnaces are made to contain from 10,000 to 12,000 crucibles. When the metal is solidified they are broken to pieces, the iron being brought in an annealing oven and kept therein for forty-eight hours, where it is left to cool slowly. If this precaution is neglected the damask becomes brittle as glass does, and is then useless.

2d. *The damask of Kaswine* is entirely made in the same way, but instead of common iron the heads of old horseshoe nails are taken.

3d. *The damask of Khorassan.* This is superior to those already mentioned. Since the supremacy of Nader-Chah, who destroyed all its ovens, it is no longer manufactured.

4th. *The damask of Arsindgan, Neres, and Schiras,* is sold for an equal weight of gold, there being very little in existence, as all the furnaces of those places have been destroyed long ago and never rebuilt.

The damask of Khorassan possesses dark designs and is very brilliant. That of Kaswine possesses a gold-like reflex. The designs are intertwisted, presenting in general a series of circles.

The armorers buy the damask, the quality of which they know from long experience. For the purpose of testing it they heat, for instance, a piece to red heat and forge it then to a length of one foot and a half. If scintillation takes place it is considered of a bad quality, and also when the surface does not present a perfect evenness.

Size versus Numbers.

The Report on Obstetrics of the Medical Society of Illinois, while it states that only 653 births have been reported, humorously says:

"Our Western mothers are only keeping pace with the rapid and extraordinary development in the great West. Our wide spread and deep-soiled prairies, all must admit, produce larger corn, and more of it, than States further east are capable of doing. No one need now be surprised at anything in the great West, especially at large babies in Illinois; for we can feed, take care of, and raise more of them than any other State of equal population on the globe."

The committee is impressed with the belief that children in this country are larger than statistics show them to be in the European States. Four of the children reported weighed at birth 12 lbs. each, two, 14 lbs, and one 17½ lbs. These are all larger than any reported by Cazeaux in 3,000 births, three of them are larger than any reported by Madam La Chapelle in 4,000 births, or than were witnessed by the celebrated obstetricians Proffessors Meigs, or Hodge. We offer our editorial hat to the State of Illinois!

Hair-washes.

It is only right to refer to a source of possible disease which is peculiarly wide-spread just now, and against which the public should be cautioned. At the present time there is quite a rage for the use of hair "washes" or "restorers," which, whilst the charge of their being "dyes" is indignantly repudiated, yet in a short time "restore" the color of the hair. The active agent in these washes is, of course, lead. In the majority of cases, probably, a moderate use of such a lotion would be unattended with mischief; but it is worth remembering that palsy has been known to be produced by the long-continued use of cosmetics containing lead. But of the thousands of persons who are now applying lead to their scalps, there will doubtless be some with an extreme susceptibility to the action of the poison, and these will certainly run no inconsiderable risk of finding the "restoration" of their hair attended by loss of power in their wrists.—*Lancet.*

THE SUEZ CANAL.—There were in all 96,864,554 cubic yards of excavation to be removed on the line of the Suez Canal. Two-thirds, or 64,447,545 cubic yards had been removed on the 15th of September last, and the work of removal was going on at the rate of two and a half million yards a month. The two great piers at Port Said, on the Mediterranean, will, when finished, contain 326,750 cubic yards of blocks, of which less than 20,000 remain to be sunk. The canal is to be offi cially opened by the imperial schooner *Laurette,* which left Toulon for the Red Sea.

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Railroad Bridge Across the Mississippi.

On the 7th of November the formal opening of the Quincy (Ill.) Railroad bridge across the Mississippi river took place, making an unbroken railway line from the East, viâ Chicago, to Kansas City on the Missouri. When the bridge at this place shall be finished the through line will penetrate the heart of Kansas. We copy from the Chicago *Railway Review* the following description of the bridge :

"The first stone was laid Sept. 25th, 1867, the last, August 5th, 1868. Its total length, including embankments, from the Chicago, Burlington & Quincy to the St. Joseph Railroad tracks, is about two miles. The draw portion of the bridge spanning the main channel of the river consists of two spans of 160 feet each; and the main bridge consists, otherwise, of two spans of 250 feet, three of 200, and eleven of 157 each—making a total, with the mason work, of 3,250 feet. The embankments and trestle work between are 1,400 feet in length. Bay bridge, 613 feet; one draw, 190 feet long, and four spans of 85 feet each. The bridge is elevated ten feet above high water mark, and twenty feet above low water mark, on stone piers. The masonry and foundations are the work of the Bridge Company, under the direction of the Chief Engineer. The superstructure is of iron, on the Pratt truss principle. Every piece of wrought iron in the ties, links, bolts, etc., was tested in a hydraulic press up to 23,600 pounds to the square inch, and struck with a hammer, while under tension, before being used in the bridge. Theoretically, the strength before the effect of the load becomes apparent in stretching is 28,000 pounds to the square inch; while the ultimate strength is 60,000 pounds to the square inch. The bridge is so proportioned that a train of two locomotives and the heaviest freight cars strain the iron only about 7,500 pounds to the inch."

The tests made were these :

Three of the heaviest locomotives were coupled and placed at rest centrally upon the span 250 feet long, and the deflection or yielding of bridge very accurately observed by means of instruments. The total weight of the load was 300,000 pounds, and the maximum deflection at the center of the span was 2·4223 inches, being one-sixteenth of an inch less than the deflection previously calculated.

The same load was then placed upon a span 157 feet long, and a deflection produced of 1·375 inches, which varied but little from the result of previous calculations.

The three locomotives, still coupled, were then run over the 157 foot span several times, at rates of speed varying from ten to sixteen miles per hour. The deflection produced was 1·406 inches, being an increase of only 3·1 inches over the deflection while at rest. Probably no severer strain than the above will ever be applied to the bridge in actual use. In each case, on the removal of the load, the bridge at once resumed its previous form.

The strain applied to-day was 5,100 pounds to the square inch of wrought iron, and 5,800 pounds per square inch of cast iron.

On the 157 feet span, the strain applied was 9,000 pounds to the square inch on the wrought iron, and 10,200 pounds to the square inch on cast, being about one-quarter more than the strain produced by the passage of the heaviest freight trains. All the wrought iron had been tested before being used by a strain of 23,000 pounds per square inch. Specimens of the wrought iron which were subjected to the ultimate strain, broke only at from 60,000 to 80,000 pounds per square inch. The total cost of the structure was $1,500,000.

Improvements in Steam Navigation--How they will Affect the Old World.

The London *Spectator* has the following :

"Suppose it true, as many men of mark and science believe, that the next great step may be in sea-going steamers, that international communication may be accelerated as internal communication has been, that we may yet see New York brought within two days' journey of Liverpool. The probability is that in ten years every social condition now existing in Europe would have ceased to exist, that the millions who toil for others, and on whose toil modern society is built, would choose to toil for themselves, would precipitate themselves in a rush, to which all the movements of mankind have been trifles, upon the new world. Suppose the population of Britain and Germany reduced to ten millions each—a change less in magnitude than that which has occurred in many countries—and these ten millions only retained by advantages as great as the new world can offer, what would all the changes of the past half century be to that? This may happen, even without any application of Stephenson's great idea—the one idea he never worked out—that if engineers, instead of trying to increase the power applicable to driving ships, were to reduce the friction which retards ships, the world would speedily be one great parish. This writer, who has seen many countries and lived among many races, seriously believes that of all the dangers to which Europe and European society are exposed none is so formidable as the passion for emigration; seriously doubts whether, if education once spreads in Europe, it will be possible to retain its population cooped up in their narrow and half exhausted corner of the world. We think, we English, that we know what emigration is; but we know nothing about it, have no idea of the changes it would involve if aided by the whole force of the masses then in possession of the supreme political power. Suppose those five-sixths of the Englishmen who now work for others choose to go elsewhere and work for themselves. The change between Waterloo and Sadowa would be very slight compared with the change between 1868 and 1918, and there is not a sensible man in England who will declare that alteration beyond the reach of thought. Why should not emigration in England and Germany attain the height it has reached in Ireland, and the masses insist on aiding it through the national fleets. The Irish would if they had the power, and the British have this year the power conferred on them. We say nothing of a discovery which, if it is ever made, will remold all human society, slowly pulverize all differences among nations, fusing the world into one people, and immediately destroy all existing political arrangements—the discovery of a means of maintaining and guiding a raft ten feet or so in the air; for we cannot resist a totally unreasonable impression that the discovery will be made; that progress will not in our time make that astounding leap. Apart altogether from that, there are physical forces now at work strong enough to change the whole face of the world, by shifting its populations."

PRACTICAL RECIPES.

WHITEWASH FOR OUTSIDE WORK.—Take of good quicklime half a bushel, slack in the usual manner and add one pound common salt, half a pound of sulphate of zinc (white vitriol), and one gallon of sweet milk. The salt and the white vitriol should be dissolved before they are added, when the whole should be thoroughly mixed with sufficient water to give the proper consistency. The sooner the mixture is then applied the better.

CHAPPED HANDS, ETC.—In this season of cold winds many are suffering from chapped hands, lips, and faces. The following course will scarcely fail to cure, and is almost certain to prevent these inconveniences. Wash the chapped surface with fine soap, and while the soap is on the hands place in the palm a tablespoonful of Indian meal. Before removing the soap, scrub the hands thoroughly with the meal and the soapsuds, then rinse the hands thoroughly with soft tepid water until all trace of the soap is removed, using a little meal each time until the last, which will aid greatly in removing the soap and dirt from the cracks in the cuticle. Finally, wipe the hands very thoroughly and rinse them in enough water to moisten their surface, in which has been poured a quarter of a teaspoonful of pure glycerin, dry them without wiping, using a mild heat, and rubbing them until the water has all evaporated. By this process, the dirt will have been all removed, and in its stead will remain a coating of glycerine. The effect of this application will be apparent by morning, if it be made upon retiring to rest; and whoever tries it once will do it a second time. The glycerin must be pure, however, or it will irritate instead of healing.

TO REVIVE THE COLOR OF BLACK CLOTH.—Take of blue galls, bruised, four ounces; logwood, copperas, iron filings, free from grease, and sumach leaves, each one ounce. Put all but the iron filings and copperas into one quart of good vinegar, and set the vessel containing them in a warm water bath for twenty-four hours, then add the iron filings and copperas and shake occasionally for a week. It should be kept in a well-corked bottle. It may be applied to faded spots with a soft sponge. It is good also to restore the black color of leather when it turns red, the leather being previously well cleaned with soap and water.

TO PREPARE CASKS FOR CIDER.—Cider should never be put into new casks without previously scalding them with water containing salt, or with water in which pomace has been boiled. Beer casks should never be used for cider, or cider casks for beer. Wine and brandy casks will keep cider well, if the tartar adhering to their sides is first carefully scraped off and the casks be well scalded. Burning a little sulphur in a cask will effectually remove must.

TO MAKE A PURE CARAMEL.—The commercial caramel is a solution of burnt sugar in water. It is rarely pure, often containing undecomposed sugar and bitter compounds generated during the heating process. To purify its solution, it should be filtered and alcohol added until no precipitate is thrown down. The precipitate is a dark brown powder, in many instances almost black, and is pure caramel, soluble in water, but insoluble in alcohol.

TO FILL HOLES IN IRON CASTINGS.—Sulphur one part, sal-ammoniac two parts, powdered iron turnings eighty parts, make into a thick paste with water immediately before using. The materials should also be kept separate until the time they are wanted.

A NEW TOY FOR YOUNG AND OLD.

Probably there is not one of the readers of the SCIENTIFIC AMERICAN who has not derived amusement from the spinning of tops; and the variety of their forms and performances is so great that we might have supposed the field of invention had been fully cultivated and reaped; but after seeing the old toy adapted to exhibit mechanical and optical effects, we expect still further advance in "top dressing"—to continue our figure of cultivation.

The Japanese have latterly astonished us with their performances in the top department, but we think they have not exhausted the powers of entertainment from top-spinning, judging after the novel exhibition we have witnessed, by one of our old correspondents, whose signature to several articles on amateur turning some of our subscribers will recognize.

He has penned a description of the top he employs, on which, after perusal, any of our young amateur friends may exercise their ingenuity in imitating. We promise that they will not only be interested but entertained; and as the inventor declines to take out a patent, and prefers to offer its free construction to our friends in the toy manufacture, we ask a careful examination of his device, statement, and explanation.

A PRACTICAL acquaintance with the hand tool will save the machinist many hours of vexatious labor.

The Tea Trade in New York.

A correspondent of the Troy (N. Y.) *Times* gives some interesting facts in regard to the tea trade of this metropolis, some of which we referred to on page 122 of No. 8, current volume, SCIENTIFIC AMERICAN. He says :

There are a few places where we are wont to drop in and take a cup of tea, which to a wanderer in this great labyrinth is very acceptable. We do not refer to the restaurants, which are very well if one can do no better, but to the tea brokers in Wall street and that vicinity. These gentlemen always have some extra qualities on hand, and the kettle is never off the boil; and here one can brew a cup of gunpowder, young or old hyson, or breakfast tea in a minute by the watch. Formerly teas were sold at auction, and in this way a cargo of ten thousand chests could be disposed of in an hour. The great center of the tea trade was then the Phenix salesroom, in the *Journal of Commerce* building, for which a rent of $40 was exacted for each sale. The sample chests were placed on examination one day previous, and each chest was numbered and then tapped with an auger for sampling, while a pile of catalogues lay on the desk. On some occasions over two hundred sample chests might be found, and it was no small task for a grocer to examine this array of different qualities in a single day. But it had to be done, and hence the room would be crowded, each man chewing and smelling, and in every possible way reaching an estimate of value which he penciled on his catalogue so as to be prepared to bid. Some dealers took the liberty to send boys for samples which they tested in their own offices, the samples becoming the perquisites of the clerks, and sometimes amounting to a large value. The floor of the salesroom would be covered with tea dust and the general waste of the article would be very great, averaging six hundred pounds at each auction. The purchase of tea under such circumstances was a great trial of skill, the bidding being for the first choice out of ten lots, and each subsequent choice being put up until the whole was disposed of. Some having got the bid would choose a lot whose inferiority would at once attest their ignorance and call forth a general smile of ridicule.

The autioneer on these occasions was almost invariably the late Lindley M. Hoffman, whose eloquence on the stand was only equaled by his grace of action. He was a small man, full of motion, which, in his case, was like the performance of an acrobat. At one time he would be on one leg, at another both arms would be over his head, while his whole body would be convulsed with excitement. He had a marvelous memory of name and face, and amid a hundred voices would discover the first claimant. We have seldom been more rapt by any oratory than by his magic performance, and we can understand the full meaning of that man who said he would rather hear Hoffman sell a cargo of teas than attend the best opera.

With the death of Hoffman, tea auctions went out of use and the present fashion of brokerage commenced, with which importers are generally better pleased. They save the waste, which is at least equal to five hundred dollars on each sale, while the auctioneer's fee and rent of salesroom are two hundred dollars additional. There are about a half-dozen tea brokers here, and all tea imported into this city, with a very few exceptions, passes through their hands. Their offices contain hundreds of samples placed in the boxes, and they can in an instant show a purchaser the grade he may require. This is tested by making a cup of tea, the drawing being invariably of the weight of a five cent silver coin, which always rests on the tiny scale. Tea tasting is exceeding hard on the nervous system, and while it may be very pleasant for us to drop in and take a casual drink, it is a very different thing to taste a hundred samples in a day. No one who has not a very enduring constitution can long maintain this continual stimulus. One of the best tea tasters in America is a nervous, timid man, who should have been very rich, but he is not, and never will be. He deals in the article, but in such a small way that it does not amount to a success. Had he possessed nerve to operate boldly, he might have been a millionaire; but as it is, after thirty years of trade, but little removed from the foot of the ladder. He has a rare gift, but it has been of little use.

Tea, when sold by an importer, is always weighed by a city weigher, who receives a fee for each package. The fees on a cargo amount to about $200. Down weight being always given, the jobber generally can gain a pound on reweighing it. As a rule, a cargo of tea stored for one year will gain enough by absorbing moisture to pay the interest on the capital. Hence some importers make a rule to sell no tea until it has been stored a year. We have known teas held in New York five years and then sold for nearly half less than had twice been offered for them.

Every cargo will be more or less damaged by water, and these teas are sold at auction by the underwriters. They are bought by parties to re-manufacture, which is done by coloring them with Paris green and drying them in maltkilns. They are retailed at what are called "cheap stores," where the poorest class do their trading, and where damaged goods generally find a market. We well remember the wrecking of an Indiaman off the Jersey coast, part of whose cargo was brought up reeking with salt water, and the chests were knocked to pieces and emptied on a large sail which had been spread in the street. Here we saw a mass of tea forty feet square and a foot deep, which brought about five cents per pound, and was not worth even that petty sum. Bad as it was somebody used it. The restoration of damaged tea is now a regular business, in which a number of men find employment, and thus live by poisoning others.

A Horse in Battle.

Kinglake, in his "History of the Crimean Invasion," gives the following graphic description of a horse in battle :

"The extent to which a charger can apprehend the perils of a battle-field may be easily underrated by one who confines his observation to horses still carrying their riders; for as long as a troop-horse in action feels the weight and hand of a master his deep trust in man keeps him seemingly free from great terror, and he goes through the fight, unless wounded, as though it were a field day at home; but the moment that death or a disabling wound deprives him of his rider, he seems all at once to learn what a battle is—to perceive its real dangers with the clearness of a human being, and to be agonized with horror of the fate he may incur for want of a hand to guide him. Careless of the mere thunders of guns, he shows plainly enough that he more or less knows the dread accent that is used by missiles of war while cutting their way through the air, for as often as these sounds disclose to him the near passage of bullet or round-shot he shrinks and cringes. His eyeballs protrude. Wild with fright, he still does not commonly gallop home into camp. His instinct seems rather to tell him that what safety, if any, there is for him, must be found in the ranks; and he rushes at the first squadron he can find, urging piteously, yet with violence, that he too by right is a troop-horse—that he too is willing to charge, but not to be left behind—that he must and he will 'fall in.'"

This almost equals the superb description of the war-horse in Job.

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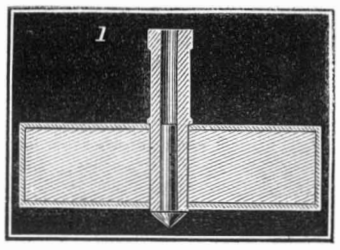
THE LENOX TOP.

This top, so named from its birthplace, Lenox, Mass., is offered without any patent or royalty, to the attention of amateur and professional manufacturers, and rests its claims for priority over all other tops on the following five combinations:

1st, It spins for a great length of time, say half an hour or more. 2d, It gives motion to other objects, during its rotation; thus making marbles, money, or China dolls, spin round it, acting as satellites. 3d, It gives motion to paper tubes, ornamented by colored and gilt papers, silk, ribbons, etc. These, when rotating on a loose spindle inserted into the stem of the top, appear like Venetian glass goblets. Also, when the spindles are made of wire and bent, the rotation gives to the wires the appearance of vases, etc. 4th, It produces a change of appearance in spiral rings, painted on circular cards, by forming circles of great beauty. 5th, It acts as the carrier of another top, on its shoulders, like Sinbad the Sailor; both tops revolving at the same time.



To effect these five objects, the same form of top and handle to spin it are employed, but the tops are of different sizes, and weights. The top is spun on a China plate or shallow saucer, which inclines to the center. The ordinary plate will answer for all the combinations, No. 1, 3, 4, and 5, but for No. 2, a larger plate, with a gradual slope or incline from the rim to the center of the plate, is absolutely essential; as the rotation of the marbles, dolls, etc., depends on the centrifugal force communicated by the top in the center of the plate, during its revolutions, to the marbles, etc., which slide down the inclined plane, and receive a rotary impulse from the central top, until its forces are entirely exhausted.

The China plate may be of 8, 9, or 10 inches, inside diameter, of hard enamel to prevent holes from being drilled into it by the steel point, and the plate should have a drop of olive oil rubbed on it to prevent the same injury. The larger the plate, the heavier you can make the top, and the longer it will keep the satellites in motion.

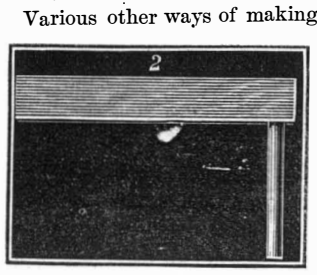
The edge of the top, which communicates motion to the marbles, etc., may be made rough, but it is better to slip on it an india-rubber band, which acts perfectly.

The top can be made of a thick disk of metal, with a hole drilled through the center; a tube is fastened into this hole leaving three quarters of an inch of the tube projecting above the disk on its upper side, and level with the bottom of the disk on the lower side. Into the bottom of the tube, insert a short piece of steel wire, having a point on the end, projecting about one quarter inch. This constitutes the whole of the top.

The handle is a piece of wood, which can be grasped in the left hand, and a steel wire passes at right angles through the end of the piece of wood. The wire must be of the size of the hole in the tube; and when inserted and held perpendicularly, the top will stand upright on the plate, and if a string has been wound around the upper projecting part of the tube, and drawn first slowly, and then quickly by the right hand you set the top in rapid motion. The steel wire must not be pressed too strongly against the inside head of the steel point, nor should it be withdrawn before the string is wound off, and the top has acquired a steady motion.

The handle will be held more firmly, if the thumb clasps the steel wire, while the wooden handle is grasped in the hand.

Various other ways of making tops will answer the purposes intended, but this top and handle are of extremely simple construction; any amateur can make it, and the time it will rotate, is greater than any top I ever tried.



Strength and dexterity in the art of spinning and the length and fineness of the cord, influence the time the top will remain up. With a silk braided fishing line, six feet long, wound three times up and down the stem, I succeeded in making a top weighing ten ounces revolve for thirty-five minutes, on a plate; and I do not consider a top well made, that cannot keep up twenty-five minutes at least.

As amateurs may like to know how to make such a top without the aid of the founder, I will describe the process I adopted for making one of the tops, I send with this.

I cut two thin brass plates with shears, into squares, drilled holes in the center to fit a piece of brass tube tightly. I then turned these pieces of sheet brass round the size of the top, by means of a screw chuck and nut.

The piece of brass tube, and one side of each of the sheet brass disks, was tinned with muriate of zinc, tin, and an alcohol lamp.

One of the disks was placed firmly and truly, on the brass tube, three quarters of an inch from the end of it. A piece of card paper was wound around the disk to form a cup or mold about one half an inch deep and fastened by a wire twisted around it. I then melted lead and old type metal, half and half, in a ladle and poured it into the card mold. The heat of the boiling fluid melted the tin on the brass sheet disk, without burning the surrounding card, and when cold the disk and tube were fastened firmly together by the melted material.

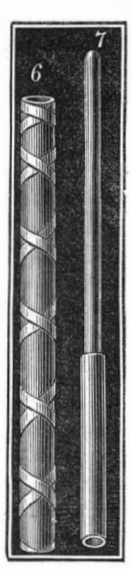
I now put the end of the tube into a chuck, turned off the face of the metal, leaving the tube on that end projecting one eighth of an inch, and turned the side true. The top now was finished with the exception of the brass disk at the bottom, which after heating the top moderately over the alcohol lamp, and applying some solder made of tin and bismuth, was placed on the projecting end of the tube and pressed until cold. I then turned a steel point, and hammered it into the end of the tube; put the top again on the lathe held by the long projecting stem, turned the steel point true to the center, and it was completed with the exception of polishing the two brass plates with fine emery paper and rottenstone. The brass plates, I also ornamented with a slate pencil dipped in water, forming circles on them by the hand; and after applying a little heat, varnished them with French copal varnish.

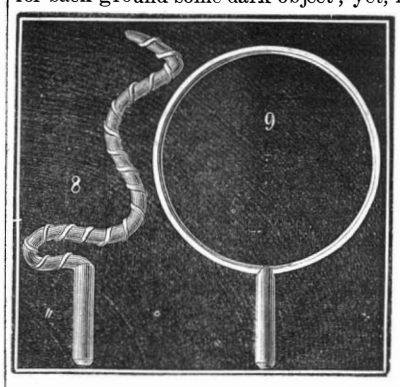
The whole top can be made accurately, without a slide rest. Of course, such tops can be made more cheaply by dies, or by the brass spinning process. This would be requisite for wholesale manufacture.

Having described the top and handle, way of spinning it, and making a top, I will describe its performance. Let me state the way in which this very amusing toy was suggested to me. I made a pair of wooden tops, or "Jennie Spinners," which you spin between the thumb and forefinger. They were made to show some young ladies the action of a lathe. After spinning one on a plate, the other was set in motion. The plate had a dip or incline to the center, and the first jennie spinner lay motionless. The second one naturally slid to the center of the plate, and, coming in contact with the first one, set it in motion a second time by friction. Following up this suggestion, I made heavy metal tops for the first motor, and, for the satellites, small saucers, which could hold dolls, etc., and which would slide down and reach the first motor. The beauty of the toy cannot be appreciated without seeing the curves and rotary movement of the waltzing dolls and circulating money, etc. These will revolve for several minutes.

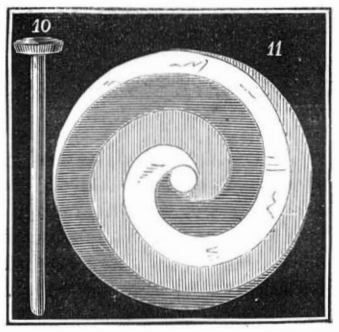
Centrifugal force, gravitation, and friction, are extremely well illustrated by this toy, beside the pleasure afforded in making the top spin, and seeing the satellites revolve. The third object of the top is to illustrate the well known fact of persistency of vision. The eye retains an image impressed on it after the object which it represented has gone. This combination was suggested by a friend placing a piece of twisted paper into the tube, whilst the top was revolving. He exclaimed, Look at my champagne glass! The hint was not lost, although I had not heard, at that time, of a toy which by a crank and wheel produced similar effects. I have not seen the toy, but it must be more complicated and expensive, and cannot afford the same pleasure to the operator. If a tube of paper, which exactly fits the upright tube, should be inserted in the stem of the top when in motion, it would only appear like a straight mast in a boat; but if the tube of paper is smaller than the hole in the stem, the upper end of the tube will lean, and as the top revolves, will show a cone. Tubes of paper are a light material, and if a wire is inserted in the lower part of the tube, and the wire is then placed in the upper stem of the top, it will keep the paper stiff, and yet give the requisite lean or wabble, to the upper end of the paper tube. Rapid rotation will leave the impression on the retina of the eye, of a wine-glass in motion.

When these tubes are colored, by painting them, or winding strips of colored or gilt paper, strung beads, etc., round them, either in rings or spirally, the effect is greatly heightened, and the revolving tubes have the appearance of the most delicate Venetian glass goblets. These tubes can be made by any young lady with note paper, a little paste, and a thin glass tube to roll them on. A glass tube is much better than wire, or wood, as it is withdrawn readily after the tube is formed. The tube is left to dry, and when dry, is printed or covered by colored strips of paper, silks, ribbons, gilt stripes, etc., according to the taste of the lady. I have more than one hundred of such tubes of every variety of color and material. Feathers, beads, loops of floss silk, &c., will suggest themselves to the maker, without any limit or more particular directions. In order to make these tubes appear more like wine goblets, a card is cut round, pierced with a small hole for the wire to pass through, and painted with colors to match the tubes. This is also a lady's pastime, and very easily done. Or, a number of colored pieces of paper, can be strung on a small screw and nut chuck on a lathe, and then rings of different sizes can be cut with a sharp chisel, thus furnishing a diversity of colored papers to paste on to the round cards, according to the taste of the lady. But a much greater effect can be produced, by taking annealed iron or brass wire, and shaping it with plyers so as to obtain the profile of goblets, jars, vases, etc; and then by covering these with bright colors, and placing the stems in the tube of a larger revolving top, most beautiful effects are produced. This is also, the handiwork of a lady, and when a heavy top weighing sixteen or twenty ounces, is used, the vases are kept steady and spin for a very long time. Nothing can be more fairy-like than these revolving spectral vases, seen by gas or a lamp at night. Although these optical effects may be produced in day light, when the operator or spectator has his back to the strong light of a single window, and places the top and vase before him, in a direct line with the eye, and has for back ground some dark object; yet, it is far more effective by gaslight, or the light of a kerosene lamp, depressed so as to throw all the light on the plate. The effect is then extremely beautiful. Another optical illusion of a very charming appearance, is produced by painting spirals in colors or cards, which have a small hole in the centre, through which a wire is passed of about two inches in length. This wire has on the uppermost end a small button, which prevents the round card from flying off while revolving. The card and wire are made to rotate, when the top is in motion, by the insertion of the wire in the top, as previously described, and then by raising or depressing the card on the wire by two other wires held one in each hand of the operator. The spirals are converted into brilliant rings, which change places, and melt into each other, as the card is depressed or raised by the two hands, in a most charming way.





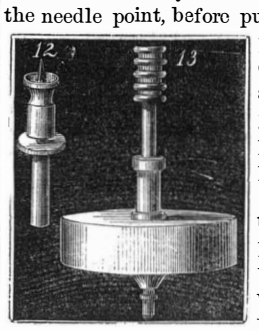
Sinbad's "Old Man of the Sea," is represented by a different top, which I call the Japanese Needle Top, made like a gyroscope top, but with a small hole in the end of the stem or spindle, to allow it to spin on a needle point. The body of this top is pierced, and like a carriage wheel, revolves on the spindle like the carriage on the axle tree, but when placed upright on its spinning point, the wheel presses on the washer near the end of the spindle, and its friction against the washer is so great, that the spindle revolves with the wheel, and becomes as rigid as if the two were soldered together. Seize, however, the upper end of the spindle, between the thumb and fingers, and then the wheel continues its revolutions by itself alone, and the spindle remains again stationary, and allows you to place it on another plate, when it again revolves with the wheel, until all the centrifugal force is expended.



This is the Japanese plan of making tops, a thousand years old, but by no means the best plan of spinning a top, if you want it to keep up a great length of time. It is, however, a very important feature of a top which requires to be moved around during its rotations, and it enables you to lift it up, and place the spinning end in a cup, attached to the upper end of another top, during the revolutions of the latter, and also, if a small hole be drilled in the point of the spindle, to place it on the point of a needle and let it spin there. The needle can be held between the fingers, or stuck into the cork of a bottle, or it can be inserted into the end of the other top.

In all these cases, which are very pretty illustrations of Japanese top spinning, the friction is so small that a top will revolve twenty minutes, or even longer, on the point of the needle.

To place the spindle on the needle requires a steady hand and sharp eye. The practice is best acquired by having the needle fixed firmly in some substance, and the top placed on the needle point, before pulling the string and by holding it pressed against the needle point during the drawing of the string, and then allowing it to rotate. If you spin it on a plate, lift it up, and place it on a needle, a great deal of power is expended uselessly.



I generally wind the string, hold the spindle in the right hand, and pull the string with the left; the wheel of the top is kept either in a vertical or horizontal position, and then I place the top on the needle point with the right hand.

A left-handed person would reverse the order. You can readily place the needle top on the needle, held in the upper stem of the revolving Lenox top by a very simple contrivance; a guiding tube with a funnel-shaped end slips on the needle and it can be held stationary (while the needle itself is revolving) by the fingers of the left hand. The guide is held a little above the point of the needle, and the needle top, when rotating, is placed in the funnel, which carries it safely on to the needle point, and then the right hand releases the spindle of the needle top. The guiding tube drops down, and both tops revolve, unequally at first, but soon in unison. The expert hand can make one top revolve to the right, while the other top revolves the contrary direction. The needle can be fastened true and firm into a brass wire which is turned true so as to fit into the hole in the upper stem of the Lenox top; a large needle or pointed wire is the best to employ, as small needles bend and break easily.

The string in all tops should be fine, strong, and as long as the arm of the operator can draw it. A braided or twisted silk line is the best.

The plates should be strong, with an inclination to the center. A common coarse French saucer answers very well, and if the needle top falls, is not so readily broken; beside, it does not cost as much to repair the breakage. The enamel of

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the plate should be very hard to prevent the point of the heavy top from drilling a hole in it. The direction to spin the Japanese needle top is to hold the fly wheel and end of string between the thumb and forefinger of left hand, wind the string around the neck of the wheel with the right hand. Now take the spindle between the thumb and forefingers of the right hand, and loosen the hold with the left hand, take the end of the string in it, pull leisurely at first and then faster until all the string is unwound, and the top rotates briskly.

Fig. 1 is the vertical section of the top of the disk of heavy metal, as lead or type metal, the stem a brass tube, the top and bottom of the top of sheet brass, the whole being soldered together, and a steel point being secured in the lower end of the brass tube. The upward projection tube is for receiving the spinning string.

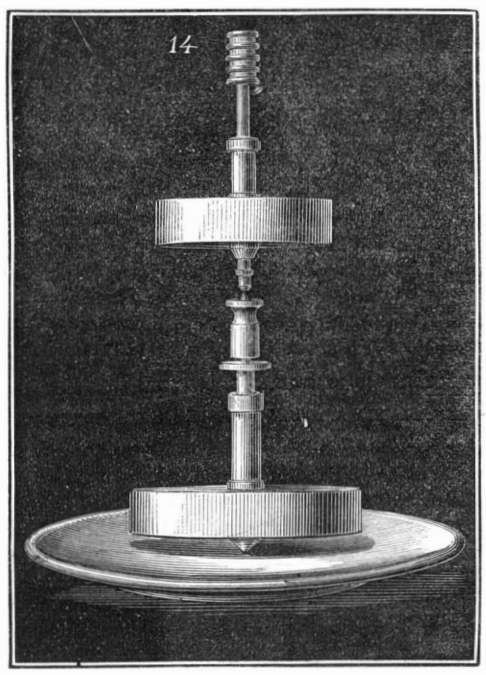

Fig. 2 is the handle, the main portion being of wood and the projection a steel wire.

Figs. 3, 4, and 5, show the various styles of amusement that may be obtained from this simple top. In one case a coin may be made to rotate, or a doll to waltz, or a bead to gyrate.

The paper tubes and bent wire experiments are shown in Figs. 6, 7, 8, and 9, fully explained in the body of the description.

Figs. 10 and 11 are the spiral card experiments; 12 and 13 the Japanese needle top amusements, and Fig. 14 Sinbad the Sailor and the Old Man of the Sea. E. J. W.

Lenox, Mass.

THE INDIANS---GENERAL SHERMAN'S OFFICIAL REPORT.

General Sherman's Report in reference to Indian affairs we regard as a very able document. He has been unable under existing circumstances to find any lasting remedy for the war. So long as opportunities are continually offered for depredations by settlers and gold hunters upon the frontiers, the Indians will commit them. Surveys of public lands progress, railroads are built, and mail routes are established. So long as these things continue, General Sherman thinks the maintaining of our military forces on the frontier will be necessary.

The whole thing is nothing more than the old war between civilization and barbarism. Either civilization must yield and cease to progress further, or the Indians must be summarily and thoroughly squelched. It is folly to reason with these savages or to ask them to agree to the terms which have been or may yet be proposed. Any concession made to them is attributed to fear on the part of the Government, and all parleying is simply a loss of time. The terms should be dictated by the Government and enforced by it in the most peremptory and vigorous manner.

The Government should not lay itself open to any charge of breaking faith in the future. It should not pledge itself to the Indians in any manner whatever. They should not be permitted to dispute, as they have done, the progress of important internal improvements. If they will not work as citizens, they should be scattered as vagabonds. If they will not submit to the impositions of the Government, they should be made to feel the strength of its arm.

The Indians have shown themselves incapable of keeping faith. They are the most treacherous, as well as the most inhuman, of all barbarous races.

General Sherman, in his report, shows the fallacy of the belief that the recent hostilities have sprung from the abuses of the Government agents, the agent at Leavenworth being the only one who is open to any such charge. Everything goes to show that the recent outbreaks were without provocation other than the gradual advance of civilization which these red skins hate.

Believing these facts to be true, we hail with satisfaction General Sherman's recommendation to take the whole matter of adjusting the Indian difficulties out of the hands of the Peace Commissioners and restore it to the War Department, which, he says, is also the desire of the Commission itself. We believe with him that the Indians will never accede to the plans and purposes of the Commission so far as to become self-supporting, and that the best that could be hoped would be to convert them into a race of paupers.

Disagreeable as is the necessity, much as our humanity may shrink from the task, we shall never see an end to these Indian troubles until a severer code of warfare is adopted with them. We must submit to see the families of our noble pioneers tortured with the most devilish ingenuity, their wives and daughters ravished and slain by these bloodthirsty fiends, or we must slay them. For ourselves we cannot hesitate. The Government has made large appropriations to the Pacific Railroad, which the danger from armed bands of hostile Indians will render worthless when completed, unless a prompt and vigorous policy compels them to go to the reservations set apart for them and to remain there. If the Government sees fit to support them upon these reservations as paupers, we shall not object, although we fail to see any good reason for so doing.

PICKERING'S VELOCIPEDE.

The velocipede seems destined to come into use in this country—though perhaps not soon to the extent that it has in France. It is so attractive and fascinating, developing so much strength and skill, and affording so great amusement to the rider, that its votaries and students will be numerous.

Of the various kinds, four, three, and two wheeled, the latter is the only artistic one, and except for unusual occasions, we would say never has the driving wheel more than three feet diameter; for ordinary use 33 inches is a good size, while for boys we would say 28 to 30 inches.

At first sight one would suppose it to be a formidable undertaking to mount and steer one of these two wheeled articles, but a few hours practice, causes the student to feel quite master of the ceremonies.

The velocipede which we illustrate this week has been designed by T. R. Pickering, of this city, and made by Pickering and Davis, 144 Greene street, and differs materially from the French in many points; it is more simple and durable, lighter, stronger, and cheaper. The reach or frame is made of hydraulic tubing. Pickering's is made by gage, just as sewing machines, Waltham watches, and Springfield muskets are made, so that when any part wears out or is broken, it may be replaced at an hour's notice. Its bearings are of composition or gun metal, and the reach or frame is tubular, giving both lightness and strength. The hub of the hind wheel is bushed with metal, and the axle constitutes its own oil box. It differs from the French *veloce* in the arrangement of the tiller, which is brought well back, and is sufficiently high to allow of a perfectly upright position in riding. The stirrups or crank pedals are three sided, with circular flanges at each end; and as they are fitted to turn on the crank pins, the pressure of the foot will always bring one of the three sides into proper position. They are so shaped as to allow of the use of the fore part of the foot, bringing the ankle joint in play, relieving the knee, and rendering propulsion much easier than when the shank of the foot alone is used as in propelling the French vehicle. The connecting apparatus differs from that of the French bycycle in that the saddle bar serves only as a seat and a brake, and is not attached to the rear wheel. By a simple pressure forward against the tiller, and a backward pressure against the tail of the saddle, the saddle-spring is compressed, and the brake attached to it brought firmly down upon the wheel.

A Singular Case of Supposed Lunacy.

A most singular circumstance has recently occurred in Louisville. One Robert Sadler being arraigned on a writ of *lunatico inquirendo*, the following appeared in testimony: It was allegated that in the night time he would alarm his family and his neighbors with screams as if in severe pain, exclaiming that he felt the pain inflicted upon persons at a distance, by amputation or other causes. Mr. Sadler was said to be of good character and incapable of wilfully feigning what he did not feel, and therefore was supposed by his friends to be insane. In consequence of this belief a writ was issued to make the proper legal inquiry and to decide the question. The jury however could not agree to call him insane and he was discharged. It was proved that he uttered his cries and expressions of pain at the precise time that those with whose sufferings he claimed to be in sympathy, were actually undergoing the operations, which would cause similar pain; and this under circumstances which precluded the belief that he could have been aware, by external means, of the time or place at which such operations were to take place. The length of time during which he had displayed this morbid sensibility had been so prolonged, that if he had really been practicing a deception it could scarcely have failed to be discovered. In his conversation, and in all other particulars except the one we have described, Mr. Sadler gave no evidence of anything except the most perfect sanity. The case seems to be well authenticated, and if the truth of the details can be relied upon is altogether a very remarkable one. It resembles very nearly, in its prominent features, the characteristics of the so-called cases of bewitchment which occurred in the earlier history of New England. It is not impossible that a recurrence of that physical affection, for such it undoubtedly was, may again recur, though it is quite impossible that its treatment would be so irrational in the present age as in the past. There is more we believe in the nervous system of mankind than has been even dreamed of in our philosophy, and such cases as the above carefully studied might be useful in throwing light upon mysteries hitherto unexplained and inexplicable.

PROTECTION OF SHEEP FROM DOGS.

It would be a work of supererogation—much more than duty requires—to say anything in praise of dogs, their sagacity, fidelity, generosity, unselfishness, courage, etc., as everybody acknowledges that some specimens possess these virtues in a remarkable degree. But we question whether their characteristics might not be summed up in the same manner that our school Olney's Geography used to designate the character of the people of different countries; thus, "The Lapps are ignorant, superstitious, vindictive, surly, and filthy in their persons; but affectionate, docile, hospitable, and faithful." While the dog—or some of his race—may be all that his lovers say, is he not also cruel, malicious, treacherous, a thief and a robber, a murderer and a slayer? Yea, a slayer for the pleasure of slaying. It is unpleasant to believe so, but the delight some dogs have in worrying innocent kittens and in teazing motherly tabbies does not speak well for their generosity or courage. Neither does the fact that one dog will kill a dozen or twenty sheep in a single night when, even if hungry, he could not eat half a one, induce a strong belief in his unselfish virtues.

Not less than half a million of sheep are killed annually and as many more permanently injured by dogs within the limits of the United States. It may seriously be questioned whether all the virtues of the canine race aggregated is worth as much as these one million sheep. Still, as hunters and guardians of property dogs are not to be despised. Cannot some simple means be devised for protecting sheep from these domestic wolves short of exterminating the canines?

A writer in one of our agricultural exchanges says that cattle, and more particularly cows with young calves, are a sure protection to sheep from the attacks of dogs and wild animals, and cites several notable cases in point, enough to establish the fact. But another writes thus:

"I have found sheep do very well among cattle, but cattle do badly among sheep. To prove it, let the farmer take the fodder left by the cattle, even when part of it has been trodden under feet, and if the sheep are not fully fed, he will see the sheep eat it very greedily; then let him take what his sheep leave and offer it to his cattle and he will find they won't eat it if they can get anything else; or, let him turn his milch cows into a sheep pasture and he will find them to fail in milk."

In this dilemma it is questionable whether it is better to have less milk and more mutton, or *vice versa*.

Original Letter from Robert Fulton.

The following letter was addressed by Robert Fulton to Andrew Brink, the Captain of the *Clermont*, the first steamboat of the Hudson river. The original letter is in possession of Persen Brink, of the town of Saugerties, Ulster county, and a copy of it was sent to the Kingston *Argus* for publication:

"NEW YORK, October 9, 1807.

"Captain Brink—Sir: Inclosed is the number of voyages which it is intended the boat should run this season. You may have them published in the Albany papers. As she is strongly made, and every one, except Jackson, under your command, you must insist on each one doing his duty, or turn him on shore and put another in his place. Everything must be kept in order—everything in its place, and all parts of the boat scoured and clean. It is not sufficient to tell men to do a thing, but stand over them and make them do it. One pair of good and quick eyes is worth six pair of hands in a commander. If the boat is dirty or out of order, the fault should be yours. Let no man be idle when there is the least thing to do, and make them move quickly.

"Run no risque of any kind; when you meet or overtake vessels beating or crossing your way, always run under their stern, if there be the least doubt that you cannot clear their head by 50 yards or more.

"Give the amount of receipts and expenses every week to the Chancellor.

"Your most obedient,
"ROBERT FULTON."

TRIAL OF VELOCIPEDES.—On Saturday, the 28th of November, a trial of velocipedes took place in this city, at the armory of the 22d Regiment in Fourteenth street. Four different makers were represented. Two of the velocipedes were of the French style, high and awkward to mount. The one generally conceeded to be the best was an American design, embracing several improvements upon the French machine. Various adroit manipulations of these machines were performed by the exhibitors. Among the most notable of these was one in which they all took part, to show the applicability of these vehicles to military service.

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THE PARSONS STEEL LINED GUN.

Mr. Parsons' converted 68-pounder gun has been tested at Woolwich with 30 lb. charges of powder, since its removal from Shoeburyness. After firing many rounds, a crack appeared in the cast iron outer tube, and for the present, experiments with the gun have been suspended. So far, the steel tube is presumably intact, though it is probable that further firing would destroy it; and as it constitutes the most costly part of the weapon, it is proposed that it shall be withdrawn from its present envelope, and inserted in another, and heavier, cast iron tube. The endurance so far displayed by Mr. Parsons' guns—that under consideration is the second that has been made—is undoubtedly remarkable, and, in one sense so opposed to all theories hitherto formed respecting the action of gunpowder that it deserves some attention.

The facts are very simple. We have in the Parsons' gun an inner steel tube, which, it is generally admitted, is quite incapable of withstanding, unsupported, even one charge of 30 lb of powder. We have, in the second place, a cast iron envelope so thin and weak that it is all but certain that a single charge of 10 lb. of powder, fired behind a 150 lb. projectile, would blow it to atoms. Steel and iron put together give us a gun, weak to excess in its parts, yet strong as a whole. In this fact lies, we have no hesitation in saying, one of the most singular problems ever offered for solution to the artillerist, or the engineer. If it could be shown that one of the two elements of the gun could alone withstand half the strain due to a 30 lb. charge, and the other element the other half, we could understand how, when put together, they could withstand the total strain due to the full charge named. But as a matter of fact, neither the steel tube, nor the iron tube alone, could bear the bursting strain of a 15 lb. charge, fired behind a 150 lb. shot. How is it, then, that when combined, they withstood 30 lb. charges so long?

In attempting to solve this question it is quite unnecessary, in our opinion, to consider for a moment the elaborate mathematical investigations which have been carried out by others, in the endeavor to find a reason for the endurance of converted cast iron guns. These, each and all, so far as we are aware, have been conducted with a view to determine how much of the strain due to an exploding charge is resisted by the steel and how much by the iron. Inasmuch, however, as no mathematician has proved that either element of a converted gun, will bear half the strain of the maximum charge which the compound gun will endure, we regard their method of reasoning, and their calculations as, so far, wide of the mark. If we find that no single engine possessed by a railway company, will draw fifty loaded trucks up a given incline at all, while two engines will take one hundred similar trucks up the same gradient at rapid pace, it is a matter of little importance to consider what share of the performance each separately fulfills; and if we further find that the tractive force is actually in excess of that deduced from calculations based on the pressure of steam, and the space passed through by the load and the pistons respectively, then the calculations must be regarded as of little or no value in the face of facts, which disprove their accuracy, or demonstrate that some element has been overlooked by the mathematician; some element, that is to say, which only operates when the locomotives combine their efforts, and which has nothing whatever to do with the isolated exertions of either. That some at present obscure influence of power, operates in the compound gun to resist disruption we have no doubt whatever; but to believe in the existence of phenomena, and to explain their causes are two different matters, and the endurance of the Parsons' gun depends, we think, on causes not yet defined or properly investigated.

Mr. Parsons' gun, weighing but seven tuns, or thereabouts, has withstood a test which has sometimes proved too severe for guns weighing twelve tuns. The steel tube of the Parsons' gun is practically the same as the steel tube of the 12 tun gun. The difference lies in the envelope alone, and this, in the Parsons' gun, consists of cast iron, in some places not more than a couple of inches thick, and in no place nearly so thick as the wrought iron guns with which it compares, in one sense, favorably. Taking the facts as they stand, we are irresistibly driven to the conclusions, either that the tensile strength of wrought iron in guns is not so great as that of cast iron, or that the metal in a gun has duties to perform, to the successful discharge of which, great tensile strength may not be essential. The first hypothesis is disproved by facts; the second we can only examine speculatively, because there are few or no facts on which to base our reasoning, other than the main fact, that a gun which, according to theory, ought to have long since gone to pieces, still remains together, and probably in a condition to fire moderate service charges for some time to come.

The first point which presents itself for notice, is that if the thin outer envelope of the Parsons' gun is sufficiently strong, then the jackets ordinarily fitted on the steel tubes of wrought iron guns are immensely too thick. Yet practice tells us, in language which there is no mistaking, that this is not the case. Are we to assume, then, that the Parsons' envelope is too thin? Again practice steps in, and says, "No." How shall we reconcile facts so conflicting? In dealing with the question we must consider the nature of the strains to which a gun is exposed, and the manner in which its various parts resist them. We have already, for the moment, rejected mathematical investigation, and they would be out of place in an article like the present dealing, as it does only with broad facts, and more or less crude speculations. We shall consider the strains to which a gun is exposed as twofold in character. The first is strictly tensile, the second it is not easy to characterise by a single word or phrase. If we term it a jarring strain, we shall, perhaps, not be wide of the mark. If we strike a girder, supported at both ends, about the middle of its length, with a heavy hammer, the tensile strain thrown on the lower web may be very small. Reasoning by analogy, and regarding the action of powder as being conformable with the theory of Lynal Thomas, and the experiments by Piobert, we arrive at the conclusion that—especially when a quick-burning powder is used—no tensile strain what ever is thrown upon the outer rings of a gun, the rending force being concentrated on the inner tube, for the simple reason that the wave of transmission of force is not propagated quickly through the metal. According to this hypothesis, it matters nothing whether the outer envelope of a gun does, or does not possess much tensile strength, so long as the inner tube does. The theory is supported by the results of experiment with the Parsons' gun. If, however, we suppose the inner tube to be so weak that it gives way at once by stretching, then the strain will be transmitted immediately to what we may term the next zone of resistance, and if this lies in the outer envelope, then the outer portion of the gun will be exposed to a tensile strain. Furthermore, the rate with which a wave of force transmission travels through various substances, probably varies very considerably with the nature of the substance. On this latter point, evidence derived from direct experiment is much wanting.

Now, the nearer the zone of maximum resistance can be kept to the central axis of the gun, the better. Guns lined with steel tubes fulfill this condition admirably. Hence their success. When we hoop a case iron gun outside, we transfer the zone of maximum resistance to the furthest point from the center. Hence the failure of the Parrott and Blakely systems. We have reason to believe that the thick inner steel tube of any modern gun, whether wrought or converted, possesses in itself sufficient tensile strength to resist the charges ordinarily used. Mr. Parsons' tube, out of its case, would, were one condition fulfilled, to which we shall come in a moment, have stood the tests to which the gun, as a whole, has been exposed with success. Indeed, the bursting force which the existing envelope can withstand is so small that it did little or nothing to preserve the inner tube.

So far we have dealt with facts, or theories ordinarily and correctly received as demonstrably true. We have now to enter on the regions of mere speculation. We have called the second strain to which a gun is exposed a jarring strain, and the precise effect of jar on metals, and other substances, is not fully understood, simply because it has never been properly investigated. It appears to act on the internal atoms of a metal, not by overcoming the attraction of cohesion, but actually by annihilating that attraction for the moment. We may cite a few instances in point. By suddenly striking a flat vessel containing mercury, the metal may be separated into a multitude of little globules; cast iron and stone may be absolutely ground to powder by the explosion of some fulminates. A very moderate blow properly, and sharply delivered, will sometimes crack a large casting. It is generally assumed of the latter phenomenon, that portions of the metal were previously in a state of high tension, owing to contraction; but there is no reason for assuming that this is always the case. The action of jar on a metal is well illustrated by striking a flask rammed with sand. The particles of the sand separate from each other immediately, and the whole falls out. We have not space to prolong our consideration of the effect and mode of action of jar. Suffice it to say that its tendency is to reduce the metal to its component particles, atoms or crystals.

Let us apply this to a gun. If we fire a heavy charge in a steel tube alone, the tube will be broken—or burst, in common parlance—not by the internal strain overcoming its tensile strength, but by the jar; and this statement has been borne out by observed facts, which we shall not stop to cite. Put the tube into another of any material which will absorb the effects of jar, and the tube will stand. Reasoning on this hypothesis, we may suppose the tube in Mr. Parsons' gun saying to the outer envelope: "A charge has been rammed home within us, and we are going to be exposed to two violent attacks, one a bursting strain, the other a jar. If you will only take care of the latter, I am competent to deal with the former." If the theory embodied in these words be correct, great tensile strength is not required in the outer portions of guns having thick steel inner tubes. With iron inner tubes the case is different, and Major Palliser's failures are, in a great measure, due to the circumstance that he used iron inner tubes—a mistake which Mr. Parsons avoids.

Are we to assume, then, that guns should have cast iron, instead of wrought iron envelopes? Certainly not. In the converted gun there is but one zone of resistance; in the wrought iron gun there may be several. Besides this, cast iron is inferior to wrought iron, because it is less able to withstand external violence, as inflicted, say, by the blow of an enemy's shot. Furthermore, it is not certain, or even probable, that cast iron is the best material that can be used in neutralising the effects of jar; its great advantage lies in its homogeneity. In order to settle the relative value of the two materials—cast and wrought iron—let a steel tube, like that used by Mr. Parsons, be similarly fitted in a wrought iron envelope of the same weight as a re-bored cast iron gun. If the work is done with care, the result will be more satisfactory with wrought, than with cast iron.

In conclusion, we must beg our readers to observe that there is one way of solving the mystery connected with the endurance of the Parsons' gun. This lies in assuming that there is in reality, no mystery at all, and that we are as far as ever from the acquision of a thoroughly trustworthy system of utilising our cast iron guns by conversion. The endurance of the gun has, no doubt, been very great—for a converted gun; but, absolutely, the performance is nothing to boast of. Mr. Parsons has done not a little to show that a good many light trifles may be made from our old 68-pounders; but it remains to be proved that uniform results, such as they are, can always be obtained, and that light rifled guns will be useful to us when we have got them.—*The Engineer*,

[The gun, a 68-pounder, 96 cwt., burst at the 33d round, the charge being 30lbs of large grained pounder with a 150 lbs shot—Eds.

EXHIBITION EXCHANGE FOR PATENTEES.

There has been felt for a long time among inventors and patentees a necessity for some headquarters in this city where they could exhibit their inventions and negotiate sales of their patents and patented wares. Heretofore the offices and barrooms of some of our hotels have been the resort of this class of persons, and many have realized handsome sums from sales in these saloons; but they are not desirable places for such traffic.

We hail with pleasure the inauguration of a new incorporated company who propose to fill a long desired want in this city, by establishing an exchange in a building on Broadway for exhibiting new inventions, and where patentees can have facilities for consummating sales.

Modern Improvements in the Preparation of Fat for the Manufacture of Soap and Candles.

For the Scientific American.

CHEMICAL COMPOSITION OF FAT.

The manufacture of soap and candles is a very ancient branch of industrial art; notwithstanding this, very few improvements were made in it before the chemical nature of fats and fatty oils was discovered by Chevreul in the beginning of this century. He discovered that these substances have a chemical composition similar to many minerals and chemical compounds; namely, that they consist of acids combined with a base. In the same manner that, for instance, gysum consists of the base, lime, combined with the acid, sulphuric acid; or saltpeter consists of the base, potash, combined with the acid, nitric acid. So all fats and fatty acids consist of a base, glycerin, combined with one or more acids, called stearic, margaric, and oleic acids.

THE MAKING OF SOAP.

In the manufacture of soap we simply combine these fatty acids contained in the fat, with a stronger base, usually potash or soda. This is best done by boiling the fat first with a weak solution of the alkali, and afterward adding a stronger solution; the glycerin being the weaker base is driven out; in soft soaps, it remains in the moisture; in the hard, soaps it is more or less perfectly removed.

Of the acids named the stearic is the hardest; it melts at 157 deg. Fah., and gives the hardest soap. The margaric is less hard, melts at 144 deg. Fah., and gives softer soap. The oleic is fluid at the common temperature and produces an inferior very soft soap. In regard to the base, the potassa produces much softer soap than the soda, and is required in larger quantity than the soda, in order to accomplish the saponification of the same amount of fat, in the proportion of 47 to 31, which are the respective atomic weights of those two bases, representing the quantities required to saturate acids.

The chemical name of fat would thus be stearate, margarate, or oleate of glycerin. All fats contain the three acids, but in different proportions; hard tallow and lard, contain the most stearic acid; human fat contains much margaric acid; and fatty oils contain an abundance of oleic acid. When boiling these fats with a strong solution of potash or soda, we form soap, of which the chemical name, therefore, would be stearate, margarate, and oleate of potassa or soda, all with more or less glycerin; and according to what has been remarked above, the hardest of all soaps is the pure stearate of soda, the softest is the oleate of potassa.

There is a great advantage in using these fatty acids in making soap, over the undecomposed fats themselves, as they require not so strong solutions of the alkalies, they unite much more readily in shorter time and at lower temperatures; even boiling may be dispensed with, and besides they produce harder and more valuable soaps by the absence of glycerin.

OLD PROCESS OF MANUFACTURING OF GLYCERIN.

We may separate the glycerin from the fats by combining the fatty acids with a base, which makes an insoluble soap; for instance, lime, or better oxide of lead. In the last case the soap is stearate, margarate, and oleate of lead, and is precipitated in the liquid which holds the glycerin in solution, which liquid is separated, and by evaporation of the water is concentrated. This is the old way of making glycerin, and such glycerin is usually contaminated with lead, and unfit for many purposes for which pure glycerin is required.

OLD PROCESS OF MANUFACTURING FATTY ACIDS.

We may separate the fatty acids from common soap, by adding a stronger acid, diluted sulphuric, acetic, etc. This acid will combine with the base potash or soda, forming a soluble salt, the stearic, margaric and oleic acids are set free, and being insoluble and lighter than water will float on the liquid. Also this is one of the old ways of preparing these acids, but now gone out of use by later inventions.

DISCOVERY OF THE PRINCIPLE THAT WATER, HEAT, AND PRESSURE WILL DECOMPOSE FATS.

In 1822, it was found in England that in a steam engine of Perkins, which worked under very great heat and pressure, and in which the steam condensed in cylinder and air pumps was continually returned to the boiler, the fats and oils abundantly used for lubricating the piston and cylinder became, by the action of the hot water and steam, decomposed into other substances, which were analyzed by Faraday, who pronounced them to be identical with the glycerin and fatty acids of Chevreul, and the result of this investigation was published in the London Philosophical Magazine and Journal in 1823, under the title: "*change of fat by water, heat, and pressure in Perkins' steam engine.*

About thirty years elapsed before any one took advantage of this discovery, till about 1850 the use of superheated steam

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was put into use in Germany to decompose the fats into acids and glycerin. During the following ten years different arrangements of apparatus were patented here and in Europe, to accomplish the same purpose with water, heat, and pressure, as announced by Faraday in 1823. The earliest of these particular arrangements, patented in 1854, was by experience found impracticable, but another of somewhat later date, was extensively introduced; its peculiar feature being to keep the hot water and fat in a permanent emulsion or mixture, by a very ingenious and simple system of circulation. In strong copper vessels, hermitically closed, and kept at a temperature of 330 deg. to 370 deg. Fah., and a consequent pressure of 7 to 12 atmospheres, the decomposition of the fat is accomplished in the course of 8 to 10 hours. The mixture of fat and water is then drawn off, when it is found that the acids above float on the top, and the water holds the glycerin in solution, which then by evaporation is concentrated, and by subsequent treatment purified.

A lower temperature may be employed for this decomposition, only the operation lasts much longer; for instance at a temperature of 212 deg. or a little above, the separation is only accomplished in several days or even weeks. At the common temperature even, an imperfect decomposition of fat takes place when moisture has access. It is this which partially causes the so-called rancidity of fat; and the bleaching of common tallow candles, by exposure to air and moisture, is such a decomposition of the fat, which, however, in this case is only very superficial.

FORMATION OF ACROLEIC ACID.

At a higher temperature, for instance 500 deg. F., a destructive change takes place in the fats, the first substance formed being called acrolein and acroleic acid, which possesses the very disagreable odor of burnt fat in the highest degree.

SEPARATION OF THE FATTY ACIDS.

The three different fatty acids, the stearic, the margaric, and the oleic are mutually separated, first from the oleic by pressing in bags at the common temperature, and the margaric from the stearic by pressing it out at a temperature of 150 deg. Fah., which melts the first but leaves the last in solid condition.

As the oleic acid is a very inferior fuel, gives a poor light, and by its acidity cannot be employed for lubricating machinery, it is mostly used for soaps, and also for greasing wool in woolen factories. The stearic acid either alone, or mixed with the margaric is employed to make the so-called stearin candles, which in fact are stearic acid candles, as stearin means the combination of the acid with the base glycerin, or the stearate of glycerin.

TEST FOR FATTY ACIDS.

To distinguish candles made from these acids, or adulterated with them, from those made of pure wax, spermaceti, or paraffin, the acid reaction of the melted fat on red litinus paper is the most simple test.

The stearic acid is also soluble in alcohol, which is not the case with fat, oil, wax, spermaceti, or paraffin.

The glycerin has found numerous very useful applications, which are increasing almost daily, and form a subject for a separate article.

Quadrature of the Circle.

In former days mathematicians devoted much time and labor to the question of determining the ratio of the diameter of the circle to its circumference. Archimedes found that it was nearly as 7 to 22, and this ancient solution is still very useful for ordinary purposes. Later researches brought it at length to such a point of precision that it would be idle to seek any further, the ratio being as a unit to 3·1415926, with a continuation of 120 decimals more. It follows, then, that any attempt to make the diameter go exactly into the length of the circumference, or to represent their ratio by an exact fraction, is simply ridiculous. As such a solution, were it possible, would enable us to make a square containing the exact surface of a circle, this problem is commonly known under the name of quadrature of the circle. At last week's sitting of the Academy of Sciences, says *Galignani*, the perpetual secretary announced that a newspaper had recently revived an old story to the effect that the Academy was in possession of a considerable sum bequeathed to it as a reward for any person who might discover the quadrature of the circle. He, therefore, suggested the propriety of again publishing the decision the Academy came to in 1775, of never more devoting the slightest attention to the solutions that might be sent in of the following problems: The duplication of the cube, the trisection of the angle, perpetual motion by means of a machine, and the quadrature of the circle. It justified this course as regards the latter by remarking that many weak-minded persons, utterly ignorant of mathematics, and laboring under the impression that large sums were ready to be handed over to them in case they succeeded in solving that problem, devoted their time to it, utterly neglecting their regular business and the interest of their families, and even occasionally losing their reason by following such a vain pursuit. M. Bertrand stated that the belief in the promise of large prizes by the Academy for the solution in question had been propagated by very serious works. The "Biographie Générale," for instance, had stated that M. Rouille de Meslay had left the Academy 120,000f. for that purpose. He stated that in the eighteenth century an inventor of the quadrature actually summoned D'Alembert before the Parliament in order to recover that sum.—*London Building News.*

STEAM pressure in the boiler, and steam pressure on the engine piston, are not necessarily alike. Allowance must be made for condensation in conveyance by pipes.

MELBOURNE, Australia, completed its thirty-third year of existence on the 29th of August last. A wilderness in 1835 it is in 1868 a fine flourishing colony.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SLEIGH BRAKE.—Milton Satterlee, Richland Center, Wis.—This invention is a neat, cheap, and easily operated adjustable brake which can readily be attached to any sleigh or sled.

FOLDING BEDSTEAD.—C. P. Alling, Jr., Sylvan, Wis.—This invention has for its object to furnish an improved bedstead, which shall be so constructed and arranged that the bedstead may be compactly, quickly, and conveniently folded for storage and transportation, and in such a manner that the frame of the bedstead may be protected by the slat frames that form the bed bottom from injury while stored, or while being transported.

PAPER RULING MACHINE.—William C. Smith, Brooklyn, N. Y.—This invention has for its object to furnish an improved attachment for paper ruling machines, by means of which the paper, while passing beneath the pens, may be kept smooth and free from folds or wrinkles, so that the ruled lines may be uninterrupted.

ELEVATOR.—Thomas B. Simonton, New York city.—This invention has for its object to furnish an improved elevator for use in warehouses, stores, manufactories, etc., which shall be simple in construction, convenient and safe in use, and unlimited in power.

COVERS FOR CIRCULAR VESSELS.—John Kline, Rochester, N. Y.—This invention consists of a semi circular cover, the latter being affixed in a groove in the inner surface of the vessel. The movable cover, A, turns on the bolt or screw, and slides in a groove, cut or otherwise formed on the sides of the vessel.

REVOLVING CUTTER FOR PLOWS.—Marshall Sattley, Taylorsville, Ill.—This invention has for its object to furnish an improved revolving cutter for plows which shall be simple in construction, effective in operation, and not liable to get out of order.

DOOR FASTENING.—A. F. Kitchen, Shelton Depot, S.C.—This invention has for its object to furnish an improved fastening for the doors of corn cribs, and other outbuildings, which shall be so constructed and arranged as to protect the said outbuildings from the depredations of thieves.

STOVE.—Mrs. Sarah M. Clark, Beaver Dam, Wis.—This invention has for its object to improve the construction of cooking stoves, so as to make them more convenient and effective in use.

CULTIVATOR.—Theophilus Arndt, Mount Joy, Pa.—This invention has for its object to furnish an improved cultivator which shall be so constructed and arranged as to be conveniently and readily adjusted for performing the various operations necessary in cultivating corn at the various stages of its growth.

HARROW.—Moses Atwood, New Sharon, Iowa.—This invention has for its object to furnish an improved harrow, which shall be so constructed that, should the teeth become clogged, or strike an obstruction, it may be easily and quickly cleared without its being necessary to raise the harrow frame from the ground.

ROOT CUTTER.—G. S. Perfater, Camp Point, Ill.—The object of this invention is to provide an attachment for cutting small roots, vines, and stubble, in front of plows, and is designed to be attached to a plow in the manner hereafter to be set forth. It consists of a revolving cutter, working in the rear and above a fixed cutting point, and also working in a slit in the curved shank, forming part and supporting the fixed cutter, whereby the roots and vines will be first partially severed by the fixed cutter, and afterward completely severed by being drawn between the revolving cutter and the afore. said curved shank in which the latter works.

BLANKS FOR SPADING AND OTHER FORKS.—J. C. Richardson, Ilion, N. Y.—This invention consists in punching or cutting the blanks out of a plain strip of metal, in such a form that no metal is wasted, and which form facilitates the process of finishing the blank.

COMBINED HAMMER AND NAIL HOLDER.—Ransom W. Green, Bradford, Pa.—This invention consists of the arrangement on the handle, near the hammer of a fixed and a sliding clamping jaw, the latter being provided with a spring for causing it to clamp the nail, and a thumb piece for retracting it. It is connected to the handle by a bent strip of sheet metal whereon it slides back and forth, for clamping or releasing the nail.

EXHAUST GOVERNOR.—Samuel Trumbore, Easton, Pa.—This invention relates to improvements in governors for regulating the speed of engines used for exhausting gas from hydraulic mains in gas works, whereby it is designed to provide a quicker and more reliably acting governor, such as are actuated by the pressure of the gas in the said mains, for regulating the speed of the engines used for exhausting the same.

RAILROAD RAIL.—Henry Zahn, Toledo, Ohio.—The object of this invention is to provide a railroad rail combining several advantageous qualities. It consists in forming the rail in two parts, namely, a solid bar or rail proper, supported by a hollow base of triangular section, and having a longitudinal opening along its upper part into which a tongued rail fits.

HORSE POWER.—Milton Fisk, Sparta, Tenn.—This invention consists in the arrangement of a table to be moved around the vertical axis of a fixed bed by the horse, said movable table carrying a counter shaft and gearing deriving motion from a wheel secured to the fixed bed, and communicating it to a central spindle which may serve as the spindle of a set of stones on the top of the movable table, or as a shaft for conveying motion to other machinery when the upper stone is removed and another section shaft coupled thereto.

MACHINE FOR CLEANING ENTRAILS.—John A. Huss, Louisville, Ky.—This invention relates to the cleaning of animal entrails and so preparing them for the manufacture of sausages and other articles of use. It consists of two rollers revolving in contrary directions and armed with scraping edges affixed radially around the surfaces of the said rollers, together with other, devices perfecting the whole.

DEVICE FOR HOLDING DOORS OPEN.—W. W. Green, Jr., Janesville, Wis.—The object of this invention is to prevent the door or the knob of the lock from marking the wall by striking against it when the door is swung open and also to catch automatically and hold the door open. It consists of a knob bearing a forked spring catch affixed in the end of a knob affixed to the wash board or surbase of the wall, in a suitable position to enter a socket plate affixed in the bottom part of the door.

MUSKETO NETTING.—Charles B. Seaman, 'Honesdale, Pa.—The object of this invention is to provide a simple and convenient apparatus for excluding musketoes or flies from sleeping persons. It consist of a rectangular frame of wood of suitable dimensions to inclose a person, and provided with several wooden or wire bows arising therefrom, and longitudinal rods over which a musketo netting is stretched.

DOG POWER MACHINE.—A. W. Hager and J. H. S. Grove, Waverly, Iowa.—This invention relates to machines for utilizing dogs by causing them to drive light machinery, as churns, washing machines, grindstones, and the like.

TENONING MACHINE.—Wm. Gilmore, Hudson City, N. J.—This invention consists in the arrangement of a sliding clamping carriage on a table, and a pair of vertically-reciprocating cutters on a suitable frame and operated by foot power.

POUNCE HOLDER.—Robert Cushman, Pawtucket, and John R. Dennis, Central Falls, R. I.—This invention relates to a new instrument for closing the pores of paper after the same have been opened by an eraser, so that the ink may not run on such erased parts of the paper. It also consists of a handle to which a bag is fastened that contains rosin and chalk, or such other material in a powdered stare, by which the pores will be closed, the powder having the color of the paper to be smoothened.

PLANT PROTECTOR.—Dr. J. M. Hurt, Blacks and Whites P. O., Va.—This invention consists of a hollow cylinder made of any suitable material and size, with a glass top near one end, and perforated for a suitable proportionate part of its length from the end having the glass cover which is to be set over the plant for the purpose of protecting it. Patented Oct. 27, 1868.

SPUR FOR ICE AND OTHER PURPOSER.—C. F. Wieland, Darmstadt, Ill.—The object of this invention is to provide a simple, convenient, and effective spur or creeper, so-called, for walking on ice or inclined roofs of houses. It consists, in general terms, of two U-shaped metal plates; one constituting the heel plate, and the other which is pivoted to it in such a manner as to fold back on the heel or forward under the sole of the shoe, gears pointed studs which enter the surface walked on, and thereby prevent the wearer from slipping. A coiled spring is arranged on one of the hinge pintles of the movable part and is enclosed within a case affixed to the heel plate. This spring keeps the movable part upon the heel when not wanted for use, and a spring catch device retains the movable part under the sole of the foot when in use as a creeper.

ADJUSTABLE HOLDBACK AND EXTENSION POLE FOR WAGONS, SLEIGHS, ETC.—W. W. Rexford, Loch Sheldrake, N. Y.—The object of this invention is to so arrange the holdback on a carriage pole that it can be moved backward and forward on the pole, so as to be adjusted to different kinds of harness and to horses of various sizes. It further consists in attaching the holdback projection or ear to a tube which slides on the front end of the carriage pole, and which can be locked to the pole in any desired position by a suitable spring catch. The invention also consists in fitting around the front end of the pole, and in securely fastening the same, a metal tube which has a groove or feather corresponding to a feather or groove on the holdback tube, and which has perforations to receive the aforesaid spring catch.

BOTTLE-FILLING MACHINE.—Peter M. Sherwood, New York city.—This invention relates to improvements made in a bottle filler, for which Letters Patent were issued to Theodore Cochen, dated Jnne 5, 1866.

SAW COTTON GIN.—William Sutton, Washington, Ga.—This invention relates to a new and useful improvement in the construction of hoppers for saw cotton gins, and also in a new and improved construction or arrangement of the breast through which the saws work, whereby several advantages are obtained over the ordinary saw cotton gin in use.

LEVER WATCH MOVEMENTS.—William Borthwick Smith, Coventry, England.—This invention consists in an improved construction of lever watch movement or frame, with the application thereto of a T-lever escapement (detached or otherwise) working in a straight line or at a slight divergent angle, and having the same action as in the ordinary construction.

STONE PRESS.—James W. Gaines, Clarksville, Texas.—This invention relates to a new and improved press for mill stones, whereby the grain is better distributed than usual in passing between the stones, the grain more thoroughly ground and a larger product of flour obtained from a given quantity of grain.

SEED SOWER.—Gottfried Rank, Greenleaf, Minn.—This invention relates to a new and improved machine for sowing seed broadcast, and it consists in a means for scattering the seed and protecting the same from the action of the wind while being sown or scattered upon the ground.

COMBINED CRUSHER, HARROW, AND ROLLER.—John Simpson, Charleston, Ill.—This invention relates to a new and improved device for crushing, harrowing, and rolling the soil for the purpose of rendering the same light and pliable to favor the growth of crops.

WATER WHEEL.—S. J. Thomas, Dawson, Ga.—This invention relates to a new and useful improvement in the buckets of water wheels and it consists in the constructing and arranging the buckets in such a manner that the best possible effect is obtained from the reactive force of the water.

WATER WHEEL.—Wm. E. Tate, Cambridgeport, Mass.—This invention relates to a new and improved water wheel which is also applicable for measuring water or may be used as a water meter.

FOLDING CHAIR.—Adam Collignon, Closter, N. J.—This invention relates to chairs that are made to fold up whereby, they are rendered much more convenient for storage and transportation than chairs of ordinary construction.

HOT AIR FURNACE.—S. J. Hare, Louisville, Ky.—This invention relates to improvements in furnaces for heating air for warming buildings and consists in the arrangement of drum and air passages in combination with the air box and combustion chamber.

VARIABLE CUT-OFF.—Thomas Hansbrow, Sacramento, Cal.—This invention relates to a new and improved method of controlling the speed and action of steam engines, whereby the quantity of steam supplied to the cylinder is proportioned to the work.

APPARATUS FOR OPENING AND CLOSING HATCHES.—James D. Sinclair Brooklyn, N. Y.—The object of this invention is to produce an apparatus by means of which any one or all of the hatches in a magazine, storehouse, or other building can be conveniently opened or closed by a person standing on one of the floors, so that it will not be necessary for such person to go for that purpose to each and every floor.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address the correspondent by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

J. C. R., of ——The glass used in an aquarium can be advantageously cemented to the frame by good putty made of white lead and linseed oil. Before putting in the fish, etc, water should be allowed to stand in it, and be changed until no taste or smell is imparted to it.

C. H. D., of N. Y.—The phrase, "The cup that cheers and not inebriates," is perfectly grammatical. The placing of the negative adverb before the verb, inebriates, without the auxilliary *does*, is not perhaps in exact accordance with our English idiom but does not by any means exceed the license accorded to poetical writers.

W. C. W., of Mich.—Registers for admitting hot air should always be placed at the bottom of the room intended to be heated by them —Ventillating registers should be placed near the ceiling.

C. G. C., of Pa.—The later Polar Expeditions have attempted to follow the Gulf Stream, in the hopes of thereby attaining a higher latitude than would otherwise be possible, but they have not reached the open Polar sea.

A. L. of Mass.—The curative or medicinal properties in petroleum (sold under various names) is owing to its carbonaceous properties. It is a hydro-darbon. The carbon contained in cod liver oil constitutes also its medicinal value.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

SPINNING COTTON AND OTHER FIBROUS SUBSTANCES.—John Whitin, Whitinsville, Mass. Oct. 7, 1868.

3,070.—WATCHES, CLOCKS, AND OTHER TIME PIECES.—Henry Josephi, New York city. Oct. 8, 1868.

3,091.—BINNACLE FOR IRON SHIPS.—Charles Ole Olsen, New York city. Oct. 8, 1868.

3,151.—APPARATUS FOR GENERATING ATD BURNING THE VAPOR OF HYDROCARBON LIQUIDS.—David Lowe, Boston, Mass. Oct. 14 1868.

3,155.—ELASTIC MOLD.—Thomas Taylor, Edmund P. Rogers, and Miers Coryell New York city. Oct. 15, 1868.

3,165.—BREECH-LOADING FIRE-ARM.—Valentine Fogerty, Boston, Mass. Oct. 15, 1868.

3,196.—CARRIAGES FOR ORDNANCE.—Geo. R. Wilson, Washington, D. C. Oct. 19, 1868.

3,131.—REVOLVING AND REPEATING FIRE-ARMS.—F. A. Le Mat, New Orleans, La. Oct. 13, 1868.

3,171.—MANUFACTURE OF SIRUP AND SUGAR.—N. Pigeon, Brooklyn, N. Y. Oct. 16, 1828.

3,189.—SCISSORS.—Sarah H. Brisbane, Fordham, N. Y. Oct. 19, 1868.

3,227.—CARRIAGE WHEEL.—Walter K. Foster, Mass. Oct. 21, 1868.

3,233.—MACHINERY FOR PROPELLING WATER CRAFT.—Edwin S. Renwick, New York city. Oct. 22, 1868.

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The Great Abattoirs at Communipaw, New Jersey.

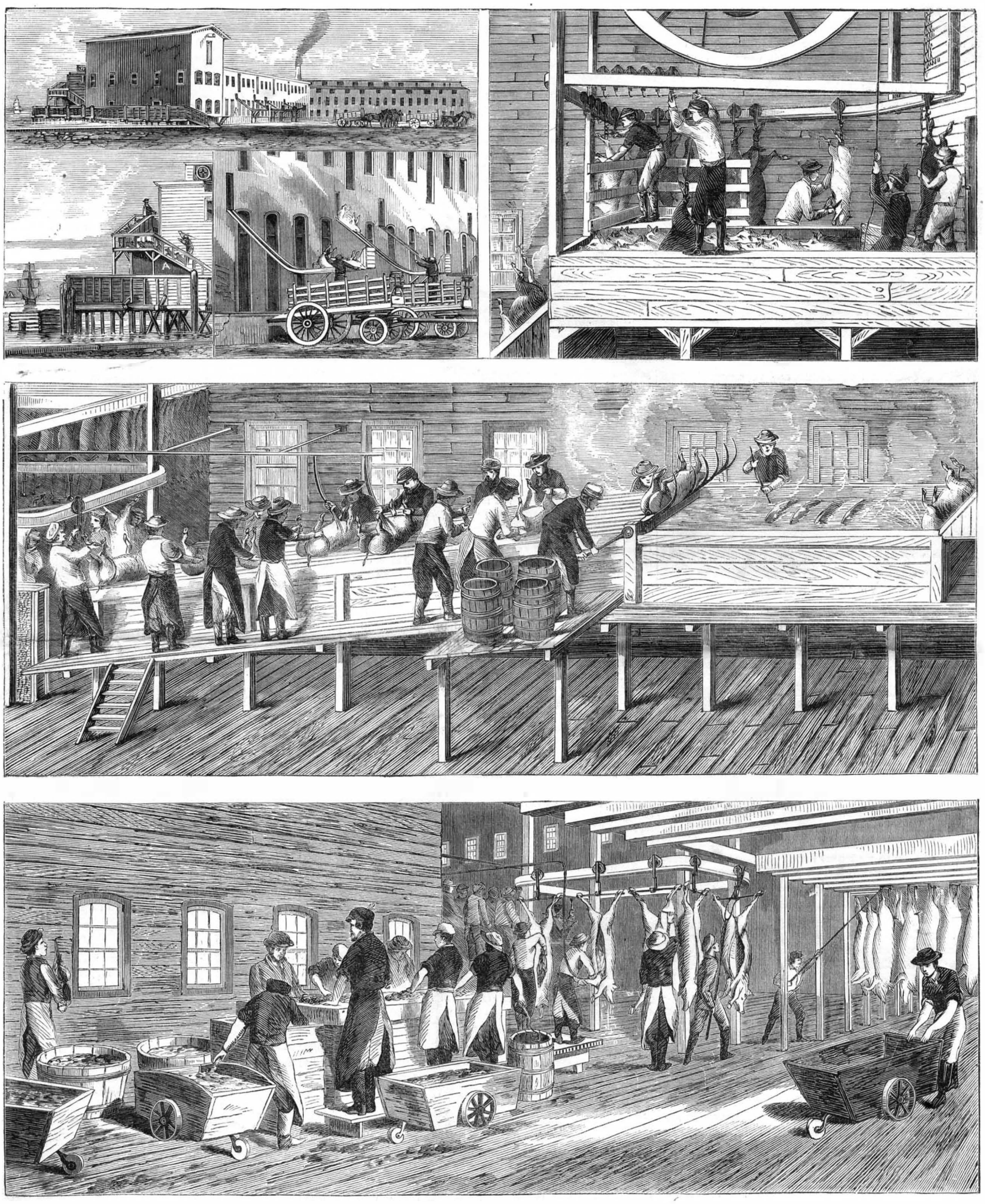
We give in this number a series of engravings representing the buildings of the "New Jersey Stock Yard and Market Company," with the process of dispatching hogs and preparing their carcasses for the market. It will be of interest to many of our readers in the vicinity of the metropolis, and to those engaged in raising beeves, sheep, and hogs, for the market, especially in the South and West.

The buildings and stock yards cover fifteen acres of ground, and the capacity of this establishment for slaughtering and preparing is, of beeves, 7,000; hogs, upward of 35,000, and of sheep, over 25,000 per week. The slaughtering and dressing of a bullock requires from ten to twelve minutes, and for hogs and sheep still less. The abattoir proper, or slaughter house —engraving on the left—is 620 feet long by 60 feet wide, with an L 100 feet long by 40 feet wide. Another building, not shown in the engraving, 40 by 40 feet, is for slaughtering sheep. All these buildings are of two stories. A steam engine of twelve H. P. drives shafting for hoisting, etc., and the buildings are plentifully supplied with pure cold and hot water, of both of which vast quantities are used.

The hog department is on the second floor As the swine arrive by the cars they are driven into large pens in a building 800 by 100 feet. Here the animals are fed and furnished with water *ad libitum*. Alleys are arranged with gates through which, when opened, the hogs are led or driven, as seen in the engraving, to the second story of the slaughter house. The engraving on the right shows the first process in the killing and bleeding department. An animal being selected, and a small chain being attached to its hind legs, it is hoisted to the iron rod, squealing and struggling with characteristic vigor and obstinacy. The "sticker" then inflicts the fatal stab in the throat, and the hog is slid along the rail toward the scald ing trough, to make room for others; and ere this one is dead it has been joined by about a dozen of its companions. In this department three men and a boy are required. The scalding tank is 12 feet long by 5½ feet wide and is attended by two men.

Soon as the hog is scalded sufficiently, he is floated to a sort of rotating grating, by which he is lifted out and rolled upon the scraping table at which are fourteen men, seven on each side. The first two take off the bristles and long, stiff hairs, which are saved in barrels. The animal is then passed to the next eight, four on each side, who are designated "scrapers"; they take off the bulk of the hair, and pass the hog along to he last four, who are called "cleaners"; these clean the head and feet, and more difficult parts. At the end of the table stands a man known as the "gambrel cutter"; he puts in the gambrel and again the hog is suspended on a circular railway. The carcass, unopened as yet, is passed at once to the "gutters" who stand at the end of the fat-cleaning table. Their duty is to take out the intestines, liver, heart, and lungs, which is all done at once, and deposited by them on the fat-cleaning table, where six men are employed for that purpose. The fat, liver, heart, and intestines are steamed in tanks. The hog is next passed to the washer, where it is thoroughly washed and scraped down with a large knife. The carcass is now ready for the drying room.

At the head of the drying room there is a one track railway, along which is run, on a wheel and hook like the rest, a two-pronged lever or fork. This fork is so placed as to lift the hog by the gambrel and transport him from the dressing rack to any one of the "slides" in the drying room. He is then placed in the slide, pushed back close to his fellow, and left to drain and cool. The fat, as fast as it is cleaned, is carted by means of box trucks to the rendering tanks, ten in number, each of which has a capacity sufficient for the fat from one thousand hogs. The steam is condensed and the offal and blood used in manufacturing fertilizers.



SLAUGHTERING AND DRESSING HOGS---THE COMMUNIPAW ABATTOIRS.

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OUR PLANS FOR 1869.

The SCIENTIFIC AMERICAN will enter upon a new volume on the first of January next, at which time we shall introduce such changes and improvements as will enable us to give a largely increased amount of reading matter and illustrations.

We want and intend to have at least fifty thousand subscribers with the new volume, and there is no reason why we should not have a hundred thousand. We think it no egotism to say that the SCIENTIFIC AMERICAN is a marvel of cheapness in these times of comparatively high prices. The unprinted sheets of paper necessary for a years subscription, could not be purchased at retail for less than $3. We give two volumes of 416 large quarto pages full of valuable reading matter and fine illustrations for $3, or when sent in clubs of ten or more the price is but $2.50 per annum. Mechanics, inventors, manufacturers, chemists, engineers, and all others who take interest in the industrial progress of the world, we appeal to you to assist the circulation of our journal. You will find the volumes for 1869 far more interesting and valuable than any that have preceded it. We cannot at present enter into any particulars but we pledge ourselves to give every subscriber his money's worth.

NATURAL GAS---THE EARTH A GASOMETER.

What the interior of this globe of ours holds, whether it is a solid, a void or vacuum, or a seething mass of molten rocks, a globe of liquid fire, we do not really know. The phenomena of earthquakes, volcanoes, boiling springs, etc.; the increasing heat as the earth is penetrated; the fact that the temperature is greater at the surface of the earth, or the sea level, than above it, and the escape of inflammable gas from artesian wells, seem to point to an internal *inferno* of fire. Centuries ago, these phenomena were noticed, and their existence used as an evidence of a hell, the locality of which was the center of the earth. Still, no one of these, nor all taken together, is absolute proof of an incandescent interior.

We have never yet penetrated the crust of the globe, nor even probed the crater of a volcano and reached the great internal cavity. If the crust is, as has been estimated, about thirty miles thick, the amount of force necessary to raise the tuns of liquid lava to the orifice of a mountain is simply inconceivable, and its effects on the surrounding walls and the surface would be sufficient to materially change the physical characteristics of the country for hundreds of miles around. So, if the earthquake receives its impetus of motion and its almost incalculable power from the agitation of an internal sea of liquid igneous matter, confined within a crust of thirty miles in thickness, and the throes of this sea are transmitted and communicated through this mass to the surface, would the most disastrous earthquake known to history or tradition be sufficient to account for the exercise of such a power? The force that could move, or break, or shake the crust of the globe would be sufficient to turn our continents into bottomless seas and our oceans into mountainous deserts. At most, we have a shaking of the surface, a superficial disturbance of the ocean; but no disappearance of the sea through some cavity reaching the molten center of the globe, and no vomiting forth of a consequent mass of steam, vapor, and lava sufficient to destroy all animal life, and to make the earth a desert. Volcanoes and earthquakes may be accounted for without descending to so great a depth. If the earth's crust is thirty miles thick, there is ample room for the reservoirs of all the power-generating materials necessary for the production of eruptions and earthquakes. That this crust is not solid or homogeneous is not only proved by theories based on analogous truths, but is actually demonstrated by mining, well-boring, and the existence of immense caverns, with plains and hills, and lakes—a subterranean landscape. The increasing heat of the earth below the surface no more demands a vast internal furnace for its existence than does the superior temperature at the earth's surface over the inferior temperature of the cloud line or the mountain tops. Both may be assigned to the same, or a similar cause, that of weight or pressure, or both combined. What other occult or unknown causes, as electricity, magnetism, galvanic agencies, the nature of which we do not understand, it is immaterial now to inquire. Suffice it to say, that we *know* that the earth's crust (to use a familiar term without assenting to the theory of the believers in the igneous philosophy) is not solid, and that it contains explosive and inflammable gases which may be sufficient in quantity and powerful enough in explosive and dangerous quality to produce all the phenomena of volcanic eruptions and earth shakings. The difficulty of accounting for the extended character of these latter phenomena—earthquakes—is no greater than if the theory of an internal globe of liquid fire be accepted, as is evident by the statements made by the supporters of that theory of the thickness of the earth's crust.

That the earth (not merely its interior, but the crust of the globe) is a gas holder, it would be nonsensical to deny. All our coal, whether bituminous or anthracite, contains inflammable gases; coal mines are infested with it and many of the delvers in their depths annually lose their lives by its explosion, either from accidental causes or spontaneous ignition.

No one who is at all acquainted with the business of boring for oil will deny that emissions of inflammable gas are a necessary concomitant to well boring. In the oil regions this gas is frequentntly and extensively used as fuel for driving the engines, or rather for generating steam. A notable instance is one we mentioned twenty-one months ago, in No. 10, Vol. XVI., page 157, SCIENTIFIC AMERICAN. In that article we spoke of a large manufactory in Erie, Pa., the machinery of which was driven and the buildings lighted by the gas from an unproductive oil well. The establishment is that of H. Jarecki & Co., brass workers. For more than two years they have led gas by means of three-inch iron pipe from an unsuccessful oil well 1,200 feet distant from the manufactory, and used it as fuel for their boilers and as lights for their works. The flow is never stopped, never changed in amount of pressure; the gas is of good lighting properties, and when at night or on Sundays the works are stopped, the gas still comes; at night being lighted at the mouth of a pipe of two or two and a half inches diameter situated near the top of the main building. This light is sufficient to illuminate several streets and squares in every direction, and the escaping gas makes a noise as of escaping steam, that may be heard at a long distance, while the gas flame is not less than four or five feet high.

CHEAP ICE HOUSES---A GOOD PLAN.

As the time for securing the harvest of ice is rapidly approaching, a few hints looking iceward may not be amiss. We remember when the ice business was unknown; only some enterprising householders or wealthy men thought of such a luxury as an ice house. Yet as ice has slid out of the category of luxuries and become a comfort, if not a necessity, it is within the power of all living in the country and having access to a pond or a stream to provide themselves and possibly their neighbors with a sufficient supply of this comfort to assist in preserving perishable articles and to temper their beverage of water. In cities and large towns men singly or in companies undertake to provide the dwellers with ice, a crop that costs nothing to plant, tend, or raise, but only to gather and store, but yields handsome returns. But in the country the convenience of daily delivery of the gelid luxury is impossible and inconvenient. To our country readers, therefore some suggestions on the construction of ice houses and the preservation of ice may not be amiss.

A family ice house need not be an expensive structure. It may be built cheaply, subserve its object excellently, and add to the attractions of a homestead by being a sightly object. A building of twelve feet square and eight or nine feet high is sufficient for the wants of the most exacting family. It may be a frame building, entirely above the surface of the ground, and better if supported on posts, elevated a few inches, to be certain of good drainage. Built of joists, two by three inches, with an outer boarding, having inside another series of uprights, also boarded, from six to ten inches removed from the outer shell, with a solid floor of plank, the space between the two walls filled with tan, sawdust, straw, or chaff, and a roof of good pitch, the ice house is complete. A drain for water should be made from the floor, and the space above the uprights, between a loose floooring and the pitch of the roof, filled with straw, hay, or some similar dry, porous material. On the roof should be a ventilator, the top defended from the rain or snow.

The ice should be packed in one solid mass, the sides not reaching the inner walls of the building, but allowing a space of from six to twelve inches all around. The top of the ice should be covered with straw, and the door should be like the sides of the building, or double doors should be made, one in the outer and the other in the inner wall. Plant morning glories or any climbing plant around the building and induce them to creep up the walls and over the roof as an additional defence against the fervid sun of summer.

Two workmen, if not practical carpenters, can put up such a building in one, or at most, two days, which if taste and judgement is used will prove to be a sightly addition to the attractions of a country home, and a useful adjunct to the farm, its contents being convenient and comforting in health and invaluable in sickness. Such an ice house would prove also convenient as a refrigerator or a large scale, preserving food of various kinds and the products of the dairy.

WHAT AN AMERICAN HAS DONE ABROAD.

Mr. F. Watkins, of the London Works, Birmingham, England, arrived in the *Scotia* a few days ago, and will make a tour, before his return, through the Western and Southern States, on business connected with his manufactures. Mr. Watkins was born in the United States, where he resided until 1856, when he went to England to introduce his patent machine for making bolts and nuts. His object in going abroad was to sell his patents, expecting to realize a large sum on them. In this he was disappointed, and after spending some $25,000, and much effort, he abandoned the hope of disposing of his patents, and commenced, on a small scale, the manufacture of bolts and nuts under the title of The Patent Nut and Bolt Company. At the expiration of two years, the demand for his machine-made goods had become so great that Mr. Watkins' time and energies were tested to their full extent in augmenting the number of his machines, and extending his works until they covered some five acres, and the number of hands employed to about five hundred; the product of which was about fifty tuns of bolts and nuts per day. The works of our enterprising American have continued to be enlarged, and now they cover an extent of twenty-four acres in the city of Birmingham, and the hands employed number about twenty-five hundred—producing one hundred tuns per day of these small goods. The capital stock of the London Company, which has so quickly sprung from such a small beginning, under the management of our energetic countryman, is now $2,000,000. Mr. Watkins informs us that his shipment of cotton-bale ties to this country will reach this year the enormous quantity of six or seven thousand tuns.

The prime object of Mr. Watkins' visit at this time is to establish agencies and to receive orders for railroad supplies, of which he is undoubtedly the largest manufacturer in the world.

Mr. Watkins' taste for inventions has not abated since he first took out patents some fifteen years ago; and notwithstanding his immense business cares, when he visits this country, which is about once a year, he brings with him several new inventions on which he obtains patents, making oath to the papers as a citizen of the United States. The career of Mr. Watkins is a remarkable example of Yankee enterprise and success.

A GAS INIMICAL TO ANIMAL LIFE.

Carbonic acid is noxious to animal life although it contains two equivalents of oxygen, the life-giving gas, to one of carbon, also necessary to life. It is generated or disengaged from decomposing vegetable and animal substances, is given off in respiration, and is artificially produced by a mixture of sulphuric acid and carbonate of lime (marble). All effervescent liquids, as fermented liquors, the so-called soda water, and even well and spring water, hold more or less of this gas.

When contained in a liquid used as a beverage it forms a grateful drink to febrile patients, allaying thirst, lessening nausea, and acting as a mild diuretic and anti-emetic. But breathed as a gas it is highly noxious. Owing to its specific gravity, greater than that of the atmosphere, it settles at the bottom of distillery tanks, caves, wells, etc., especially if either of them have contained any animal or vegetable substances.

From these facts in regard to the nature of this gas it is evident that care should be used in exploring caves, cleaning cisterns and vaults, and descending into wells. Life is simply combustion, and where a candle cannot burn a man cannot breathe and live. From this it is evident that to insure safety it is a necessary precaution before descending into a well, cistern, or vault, to lower a light or some article of fuel in a state of combustion. If the flame is extinguished there is no certainty for life. Now, to remove this heavy noxious gas. If a well, containing water, draw out or pump up the water, and, the well, being uncovered, dash the water back by the bucketfull. In its passage down it will absorb sufficient air (oxygen) to neutralize the gas. A better plan, and one applicable to all cases, is to set some quickly-burning substance on fire, as a bundle of straw, or rags saturated with benzine, and drop it into the well. The object is to rarefy the heat sufficiently to raise or lift the heavy noxious gas. If the flame should be extinguished on reaching the stratum of noxious gas, the heat, by repeated trials, will be sufficient to raise the gas and render the well safe.

So many deaths have occurred from descents into vaults, cisterns, and wells, for the purpose of cleaning them, that some attention should be drawn to the danger and the necessary and simple precautions. Some twenty years ago we saw two men killed within a few minutes by descending into a vat in a distillery from which the liquor had been drawn the day before. The second lost his life by his generous attempt to save the first, and not until these two perished did those in charge of the works seem to think that any precaution was necessary. Subsequently the writer, in descending a well to recover a lost bucket came near losing his life, and was saved merely by the accident of deep water and the timely interference of the bystanders at the mouth of the well. Most of these accidents, generally fatal—occur through ignorance, and therefore we draw special attention to the simple precautions we recommend which are neither costly nor troublesome.

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REMINISCENCES OF TRAVEL IN SPAIN.

MADRID—THE ROYAL PALACE—SPANISH MANNERS.

We consider it fortunate in some respects to have visited Spain under the old regime—and before revolution had destroyed many of those ancient landmarks which add so much to the interest of the tourist—for it is notorious that revolutions in Europe have always been attended by the destruction of many rare and beautiful objects of architecture and art, which appeared to symbolize and foster oppression and cruelty.

We spent several days in Madrid and vicinity and wrote a letter for the SCIENTIFIC AMERICAN giving our impressions of that city and of its people, but for some reason the letter never reached its destination.

It was a fat looking package, and we have reasons for thinking that the post officials thought best to see what it contained. If they read it—and we think they did—some of the statements were found not very complimentary to the manners and customs of the Madrilenos. We regretted at the time the loss of that letter which had cost us some thought and labor, but had no intention to reproduce it for publication.

We think, however, in view of the interest which centers in Spanish affairs our readers may be willing to read a few stray notes about Madrid and its surroundings, which we propose to give in two or three papers.

Of the many thousands of our countrymen who make annual visits to Europe, few ever visit Spain.

Tourists usually are content to follow the beaten track of travel through France, Italy, Switzerland, and Germany. They imagine, and not without reason, that Spain is a hard country to travel in—that a trip down among the Spaniards suggests brigandage, treachery, and stilettos, discomfort and hard fare.

The hotels of the larger cities are tolerably good, it is true, but those found in out-of-the-way places are usually wretched abodes, scarcely fit for mules and donkeys, with which agreeable beasts the country is well supplied.

The floors of the houses are usually brick, fuel is scarce, and no comforts are provided against the sharp chill of a winter's night. An English gentleman, who was compelled to stop at a railway junction, informed us that he slept at one of those cheerless *posadas* upon a very tough bed, in a room having a stone floor, without any glass in the windows, and nearly starved at that, which confirms our experience. In regard to the important matter of food, it is not worth while to say much about it—oil and garlic are the staples—and to one not accustomed to these articles, fasting and prayer are excellent substitutes. Yet, in spite of all drawbacks, Spain, in some respects, is the more interesting country.

The scenery, especially in the Northern provinces and sierras, is grand and picturesque in the extreme—often desolate and peculiarly savage.

The inhabitants are also interesting in their rude manners, customs, and superstitions; whilst in the Southern provinces the cities are quaint, and the country, oriental in its character, furnishing an abundant supply of luscious tropical fruits and wines—the latter being usually kept in hog-skins which impart to it a peculiar flavor. There are also many Roman ruins (Spain was once the granary of the Roman Empire); exquisite Moorish structures; grand palaces; extensive monastic buildings, which are now being torn down; and sublime Gothic cathedrals unequaled in Europe, rich in saintly relics, precious stones, gold and silver ornaments, sacerdotal vestments and pictures—indeed the fine arts and literature flourished in the 17th century, when Spain was the proudest kingdom in Europe—but of this we may say more at another time.

It is not easy to conjecture how it happened that Madrid became the capital of Spain, but it is supposed that Charles the Fifth fixed upon it by reason of its central commanding position where he could best overlook and govern his subjects. The city stands upon a series of hills, 2,300 feet above the sea, and within sight of the snowy Guadarama mountains lying on the North. The surrounding country is entirely swept of timber so that by reason of its exposed situation the north winds sweep through it unopposed, and persons have frozen to death in winter.

In summer it is like an oven—the thermometor frequently standing at 105°. These extremes of heat and cold make it an undesirable, and at times, a dangerous place of residence. Yet, in spite of these objections, Madrid is a fine city, numbering upwards of 400,000 inhabitants, abounding in fine public buildings, broad, well-kept, well-built streets, promenades, parks, and drives. It is a modern looking city, and compared to Toledo, Grenada, Cordova, Saragossa, Seville, and Valencia, has little about it of a Spanish character—nothing to remind one of the chivalrous fighting times of Charles the Fifth and Philip the Second; and but for a few lazy Spanish gentlemen, who prefer the cloak to the paletot coat, and the hordes of miserable beggars, one might easily imagine himself in a thriving French city, so thoroughly has Paris fashion possessed itself of the costumes and equipages of the people. The ladies, however, seem to reject the hat, and usually appear on the streets with a graceful lace mantilla thrown over their heads.

In the 10th century Madrid was an outpost of the conquering Arab, and these enterprising Moors built an Alcazar for the Kalif which was destroyed by an earthquake, and the palace built upon its site by Henry the Fourth, with all its marvelous treasures of art, gold, silver, and diamond ornaments were consumed by fire. The present comparatively new palace, constructed of white colmenar stone, and completed in 1764, is undoubtedly one of the finest palatial edifices in Europe. It forms a square of nearly 500 feet, with numerous open courts, gardens, and other appendages of a royal residence, and cost upwards of four million dollars. For some reason the Queen refused to allow strangers to visit the palace, owing, it is said, to the fact that at one time an English party abused the royal hospitality by either helping themselves to some small articles, or mutilating the curtains. The palace contains among other treasures a great variety of clocks, for which Ferdinand the Seventh and his father had a great passion, though it is said of them that they never knew the right time. Charles the Fifth was also afflicted with the same horological mania, and not succeeding in making any two of his clocks go alike, he wisely concluded that they were like men's heads, always a little out of gear.

The chief open air resort of Madrilenos is the Puerta del Sol (Gate of the Sun), a considerable circular plaza, having a fine fountain in its center. This spot seem to be a central one for everybody in the city, and Spaniards, enveloped within the ample folds of their cloaks, plant themselves upon the sidewalks, where they lazily smoke and talk away valuable time, which wiser men know to improve, and appear not to consider themselves in the way of any one. The Spaniard smokes in the street; he smokes at the table, no matter who dislikes it; he smokes in the omnibus; he smokes in the cars; he smokes to the church door, and lights up as soon as he gets out; and, for aught we know, he smokes in his bed, and seems not to entertain the slightest notion that the fumes are not delicious under all circumstances; and this excessive smoking, no doubt, accounts for the cadaverous appearance of a majority of the Spanish men.

WASHINGTON CORRESPONDENCE.

FEES IN PATENT OFFICE CASES—IMPROVEMENTS GOING ON—EXAMINATION OF EXAMINERS.

Heretofore the Judges of the Supreme Court of this District have been paid a fee of $25 in each and every case of appeal from the Commissioner of Patents. Hon. Elisha Foote has come to the conclusion that such payments are illegal, and has discontinued the same, so that now and until some legislation is had in the matter by Congress, no fee will be required for an appeal to the Judges of the Supreme Court. The Commissioner takes the ground, that inasmuch as the Act of March 2, 1861, which repeals all former acts fixing the rates of the Patent Office fees, makes no mention of a fee for an appeal to the judges, none is required. If the Commissioner is right in his view of the matter, then the Patent Office has been exacting, and the judges receiving, $25 for each and every appeal that has come before them for the past seven years, without any authority of law for doing so. The judges, however, we understand, entertain a different opinion in regard to the matter. They contend that the fee paid for an appeal to them, is not a Patent Office fee, but belongs to the judge who hears the appeal; and that consequently, the Act of March 3, 1839, requiring the payment of this fee, was not affected by the Act of March 2, 1861.

Improvements in the Patent Office Building.—The sand stone tiles which have covered the first and second floors of the corridors of the old building fronting on F street, have been removed, and in their place new tiles of marble from the quarry at Lee, Mass., are now being put down, giving a greatly improved appearance to the corridors in this part of the building. In the draftmen's room the old portfolios in which the drawings have been kept since the Patent Office building was first occupied have been thrown aside, and the rooms fitted up with drawers which are hung on slides and trunnions, so that when pulled out to their extent they can be tilted into a conveniently inclined position, to admit of the ready handling and inspection of the drawings. The drawer is covered by a patent, and we understand that the eight hundred and upward which have already been put in, cost upward of twenty thousand dollars. The Agricultural Department, as you are probably aware, has moved out of the Patent Office into a building built expressly for it; and the rooms made vacant by this removal have been fitted up for, and are now occupied by the Examiners in charge of Land Conveyances, Navigation, Fire-arms, Builders' Hardware, and Chemistry.

The Board appointed by Commissioner Foote to ascertain the qualifications of Examiners and their assistants are holding daily sessions of about three hours each in what some one has facetiously named a "sweat box;" and they dispose of about two cases a day. The following are some of the questions which were been asked the candidates, viz.: "What's a parallax?" "What's a magnet?" "What's a chemical equivalent?" "What's the difference between plaster of Paris and lime?" etc., etc. Prof. Henry H. Bates, of Hobart College, N.Y., has lately been appointed a second assistant Examiner, and assigned to duty with General Spear in the class of Civil Engineering. Prof. Bates held the adjunct chair of Mathematics in Hobart College, and he passed an unusually creditable examination before the Board of Examiners.

COMMUNE BONUM.

THE ART OF PERFUMERY.—We have received a communication from Septimus Piesse, F.C.S., the well known perfumer of London, and a frequent contributor to the SCIENTIFIC AMERICAN, in which he states that he sent to the publisher at Philadelphia for a copy of the book "Guide for the Perfumer," noticed in the SCIENTIFIC AMERICAN Oct. 7th, and was much chagrined to find that it was almost an entire reprint of his own work, "The Art of Perfumery," and without a single reference either to his name or the source from whence the matter had been taken. Mr. Piesse further states that his work has gone through several editions, and that while people are welcome to the use of his recipes, he considers it unjust to appropriate his labor of twenty years without the honorable mention of his name.

THE METEORS.—Our space will not permit us to publish a large number of communications upon the above subject, of which we are in receipt. They contain few additional facts of interest, and as we are much pressed for space we are sure our esteemed correspondents will excuse us.

THE SOCIAL SCIENCE CONGRESS IN ENGLAND.

Surely there is quite enough of sorrow and suffering in this sinful world to justify any well meant, even though ill devised or misdirected efforts for the eradication of social evils. So important a movement as the recent Social Science Congress, held at Birmingham, England, gave us hopes that in the deliberations of the many learned and thinking men sure to be present at such a meeting, something practical and definite might be evolved that would contrast refreshingly with the vague and unsatisfactory proceedings hitherto characteristic of similar movements. We are however compelled to say that a careful review of the transactions of this congress has resulted in the disappointment of our hopes.

Why is the mockery of applying the name of science to a conglomeration of crude speculative opinions, unsystematized, and without the solid basis of fact persisted in. There was no such thing as social science, in the strict interpretation of the term, apparent in the deliberations of the Congress at Birmingham. Not the slightest reference, so far as we can see, to the natural laws which govern the formation of all society, or even the slightest attempt to show that those laws are violated in its present organization, and if so, how and why.

In the place of such a method, which, if there be a *science* of sociology is certainly possible, and as the true scientific method, the one of all others to be closely followed we should think in in dealing with such a subject, we have discussions upon jurisprudence, free trade, international law, neutrality of the English Government during the late rebellion in the United States, change of nationality, etc., etc.

To sum up the whole matter, the efforts of the Social Science Congress seem to have been principally directed to the display of a class of talent which society could very well dispense with and discussion of topics as foreign as possible to the subject in hand.

The notoriety which is sought by a certain class of aspirants can be gained often by persistent braying, and in our perusal of reports that have reached us in reference to the Birmingham convention, we have been painfully impressed with the belief that those who took part in its proceedings, had the good of society less at heart than the successful display of their own rhetoric. Be this as it may, we are more than ever impressed with the belief that such meetings will never result in any permanent, or even temporary, alleviation of the current evils of modern society.

Wood Gas.

Some years since we noticed at length the manufacture of illuminating gas from wood. Some of the processes which were economical before the war were found impracticable for a while. Latterly the subject appears to have acquired renewed interest.

A correspondent writes us that the cities of Wilmington, N. C., Macon and Columbus, Ga., and Montgomery, Ala., are all lighted with wood gas. Another correspondent gives the following facts about the products of the distillation of wood:

"The article in your journal of 18th Nov., 1868, on the subject of wood gas directs attention to an important and thoroughly practicable source of cheap and good gas for illuminating purposes. All varieties of wood, when subjected to distillation in close retorts, yield gaseous and liquid products, and leave a residue of charcoal in the retort. The respective quantities of these products and their quality depend chiefly on the kind of wood used, on the degree of heat to which it is subjected, and the mode in which the heat is applied.

"High temperatures produce a larger proportion of gas than low, but the yield of the liquid products is thereby diminished. These liquid products contain several substances of considerable commercial value, the most important being acetic acid, tar, and wood spirit or naphtha. When properly purified and diluted with water the acetic acid yields a perfectly trans parent white vinegar, which cannot be distinguished from the best French white wine vinegar, or the best English malt vinegar, and infinitely superior to any cider vinegar. The tar is of equal quality to North Carolina tar and may be used for the same purposes. The naphtha or wood spirit is an excellent and cheap substitute for alcohol; for such purposes as burning in lamps, manufacturing varnishes, for dissolving gums and the aniline colors, and for the manufacture of chloroform. Its value for these purposes is well known in Europe, and it is there extensively used. The charcoal may be used for all the purposes to which that substance is usually applied The gas is easily purified, and may, by suitable means, be obtained of high illuminating power. Its perfect freedom from sulphur is an important advantage it possesses over coal gas.

"Hard woods such as oak, beech, and birch, are the most suitable. Good oak treated at a moderate temperature yields as follows from one cord. The money values attached are very low, very much below their real or selling prices:

5,000 feet illuminating gas at $2 per 1,000 feet	$10 00.
50 bushels charcoal at 10 cents	5 00.
2 barrels tar at $1	2 00.
5 gallons naphtha at $1	5 00.
100 gallons vinegar at 25 cents	25 00.
1 cord of oak yields	$47 00.

"By a higher temperature more gas may be obtained with a corresponding reduction in the yield of liquid products. The manufacturing expenses are moderate and the necessary apparatus not very costly. In many parts of the country where wood is cheap and coal dear this manufacture could be advantageously substituted for that of coal gas."

THE TELESCOPE.—Professor Alexander, of New Jersey College, Princeton, delivers the second lecture of the American Institute course on Friday evening, December 4, at Steinway Hall. Subject—The Telescope and its Revelations.

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A SIGNIFICANT FACT.

During the week ending December 1st., there were filed in the Patent Office 255 applications and caveats. During the same week 103 applications and caveats were entered upon the records of this office. Inventors fully understand where their interests are best served.

THE ENGINES OF THE "WAMPANOAG."

So much has been written about the engines of this ship, that what I have to say may seem superfluous, but still it may interest a few. Commodore Alden, in his report, finds fault with the engines on account of their want of "hed" plates, supposing that English engines, of large size, are provided with that part, and attributes the heating of the journals of the *Wampanoag* to their deficiency.

The English ship *Warrior* has been often compared with the *Wampanoag*, both as regards engines and speed. Now this ship, free as she may be from hot journals, has not the sign of a hed plate; therefore it is not possible that the good working of the *Warrior's* engines can be attributed to hed plates.

The engines of the *Warrior* are of the double-trunk variety, consequently the connecting rod acts directly from the piston to the crank pin, thereby making the engines much shorter across-ship, when the distance is measured from the center of the crank shaft to the center of the pistons at half-stroke. This being so, the framings are naturally reduced in length. At the ends of the framings, in the *Warrior*, three in number, come the condensers, firmly bolted to all of them, or at least connected by a short distance piece. The cylinders are bolted close together, within a few inches of oneanother, and form a combination almost as solid as a single casting. To the two cylinders the framings are bolted directly and in the strongest manner. It is evident, that, by the adoption of this plan, a stiff and rigid combination must be the result. The framings being connected together at one end by the two cylinders, and at the other by the condensers, forms, in itself, almost a solid mass. Diagonal strains cannot affect this engine in any appreciable manner, and it would be difficult for the shaft to have its journals thrown out of line, running as it does, through the bearings in the frame between the cylinders and condensers.

Let us now look at the general plan of the *Wampanoag's* engines. The two cylinders are placed on one side of the shaft, but are not bolted directly to oneanother, the large surface condensers being interposed, but this is not an element of weakness. In looking at the framings and comparing them with those of the *Warrior*, we notice this difference, that those of the English ship are firmly connected at both ends, while those of the *Wampanoag* are secured only at the end where the cylinders are placed, and in this difference of design the reason for the hot journals may be found. Where the front of the condensers are in the *Warrior*, we find, in the *Wampanoag* the engine shaft, the screw shaft being mounted in bearings placed on the top of three of the frames, and in about the middle of their length. In front of the condensers come the immense gear wheels by which the power of the engine shaft is communicated to that of the screw. As these frames are bolted directly to the timbers of the ship, any diagonal strains coming upon the engines must of necessity elevate one end of the framings, and it will naturally be the weakest part that is moved, and that happens to be exactly where the shaft bearings are placed. The framings being long and disconnected, are susceptible of a small amount of spring—very small it must be—but sufficient to throw the journals enough from their proper line to cause them to heat. If, as in the *Warrior*, these frames had the additional support of the condensers, this thing would not happen, as the strength of the engines would be increased materially. The engines are heavy enough without the weight of an immense hed plate to perform an office, which, in the *Warrior*, from the advantageous position of the condensers, is performed in the most perfect manner.

ENGINEER.

The Iron Works of Chicago--Fifteen Thousand Men Employed--A Business or $25,000,000 a Year.

The Chicago *Times* publishes a very long and elaborate descriptive article showing the extent of the iron business, and giving the name and size of, and the amount of capital and labor employed, and work turned out by, each of the foundries and workshops in that city. From this article the following interesting facts and figures are taken:

The iron interest of Chicago employs fifteen thousand men, to whom is paid the yearly sum of $12,000,000 for their labor: $15,000,000 is invested in the manufactory of iron, which does a business of about $25,000,000 per annum. The number of iron establishments in the city amounts to one hundred, which are engaged in the manufacture of boilers, cutlery, derricks, engines, farm implements, gages, gearing, lathes, lightning rods, mining machinery, needles, nails, ordnance, plate and pig iron, quadrants, ranges, stoves, tanks, utensils of all kinds, size and value.

The "Eagle Works" are situated in the west side of the city, and their different buildings occupy different sites on five streets, 370 feet on Clinton street, 150 feet on Madison street, 300 on Washington street, 168 on West Water, and 210 on Canal. The principal articles manufactured in these works are engines, boilers, flouring mills, gang mills, circular sawmills, stamp mills, ore and rock crushers, and general running machinery. This establishment employs in the neighborhood of one thousand men, whose annual pay-roll exceeds $300,000. The estimated value of the property, including machinery and buildings, is $500,000.

The "Northwestern Manufacturing Company's Works" are run upon the co-operative system, and with a capital of $450,000, employ 375 men, and do a business of about $700,000 per annum. This establishment has also a branch called the "Northwestern Pipe Works," which has a capital of $50,000, and employs 35 men.

The "Barnum and Richardson Manufacturing Company" make castings and car wheels. Their works cover more than an acre of ground. They employ 75 men, have a capital of $150,000, and do an average yearly business of $400,000.

"McCormick's Reaper and Mower Works," is perhaps the most interesting manufacturing establishment in Chicago.

The buildings cover an area of 400 by 500 feet, in the business center of the city. The business began here in 1846, twenty-two years ago, and since that time 100,000 harvesting machines have been manufactured in these works. Fifteen years ago 1,000 machines per annum were considered a big undertaking, and predictions were then made that at that rate the country would soon be over-supplied. But now 10,000 machines per year do not begin to supply the demand, which is greatly increasing, and now already overmatches the capacity of the works. 500 men are constantly employed.

Each machine contains not less than 1,000 separate pieces of wood, iron, steel, brass, copper, tin, and zinc, making the enormous number of 10,000,000 pieces which have to be made, counted, assorted, inspected, classified, packed, and shipped in one year's business.

The following is the amount of raw material worked up in this establishment during the year: Lumber, 25,000,000 feet; pig iron, 3,000 tuns; bar iron, 1,500 tuns; paints, 100,000 pounds; oils, 5,000 gallons; zinc, 125,000 pounds; steel and other metals, 150,000 pounds, and 2,000 tuns of coal. The item of scrap lumber, the cuttings left after sawing out the peculiar shaped pieces needed in a harvesting machine, amounts to nearly 500,000 feet of lumber per annum, which provide about all the fuel necessary to make steam for the works. Everything in this establishment is done by machinery, whether of wood or iron. In the blacksmith shops, the bar iron, of large and small sizes, from five and a half to four and a half inches round, is cut up by machinery like so many pipestems. Even the forges are supplied with a steady blast of air from a large fan driven by steam. The machine shops contain one hundred lathes, drills, boring, keyseat-cutting, screw-cutting, and planing machines, worked by an almost endless arrangement of belts and pulleys. In the sickle shop of this establishment is an ingenious machine for cutting the teeth in the sickle edge, which does the work of two or three men, and much more accurately.

The machine shops of the Illinois Central Railway are also in Chicago. They employ 800 men in their establishment, whose monthly pay amounts to $60,000. Their entire works, including their car shops in the south end of the city, cover about sixteen acres of ground. The cost of construction of the machine-shops alone amounts to $150,000. The road has 4,000 cars, and 168 locomotives. They have on the stocks, and nearly finished, four of the largest engines ever built in the West, each one weighing about thirty-one tuns. The amount of raw material these works have on hand is valued at $300,000. They use up 2,200 tuns of coal per annum, principally Lehigh and Illinois.

Some Facts About North Carolina.

The *Plaindealer*, published at Wilson, North Carolina, quotes at large from our article entitled "Let Us Have Peace," published on page 329 of the present volume, and while cordially approving the views therein set forth, and testifying in the most flattering manner to the estimation in which the SCIENTIFIC AMERICAN is held throughout the South, asks us to aid in the dissemination of some facts in regard to the above State.

It states that in its immediate vicinity and throughout the State, as clear a criminal record can be shown since the close of the war as in any area of equal population to be found in any State north of Mason and Dixon's line. At least it is so as far as the white population is concerned. The laws are faithfully administered and sacredly obeyed. Property is as safe as in any civilized community to be found anywhere. It says:

"We invite Northern gentlemen to come among us, putting aside all feelings of animosity, 'burying the past,' and we pledge them a cordial welcome, and a safe field for the investment of their capital, which will bring them handsome returns."

It is with the greatest pleasure that we accede to the request of the *Plaindealer*, to assist in the dissemination of such welcome information to us and to our readers, and we think we can safely assure the people of North Carolina that when these facts become generally known an influx of capital can be relied upon. Let the Southern people remember, however, that capital is proverbially timid, and possess their souls in patience until the happy time, sure to come, when mutual confidence shall be fully restored.

Wooden Railways.

The feasibility of laying wooden railways in districts where the traffic does not require a high rate of speed, and where there is an abundance of hard and durable timber, has been recently made the subject of discussion by our Canada exchanges, and by letter we are informed that the method is proposed for Australia, a kind of timber being found there which is very hard and particularly adapted to the purpose. A. M. F. P. Mackelcan, in a communication to the Perth *Expositor*, gives a favorable opinion as to their utility based upon practical experience.

The cost of such railways being so much less per mile than those of iron, the shortening of distances by deep cutting or filling is obviated. The natural features of the district through which it passes can be complied with. The low rate of speed renders the erecting of very expensive bridges unnecessary, and as light locomotives only are proposed, the wooden rails are sufficiently strong for perfect safety.

In many parts of Canada, movements looking toward the construction of such roads are on foot, and an exchange informs us "that $96,000 have been voted by different interested townships in aid of the Toronto, Grey, and Bruce Railway, and the Toronto City Council has passed a by-law granted $250,000 for the same purpose. These sums, it must be borne in mind, are bonuses in aid of the road."

The *Kingston News* says that among the notices of application to Parliament appearing in the *Official Gazette*, is one relating to a wooden railway from Kingston to Loughborough and adjoining townships. "The projected railway is destined to be realized as a fact, and will prove the adaptability to the wants of the back townships of Canada. The people of Kingston are of course very much interested in the success of an enterprise so well calculated to improve the fortunes of the city, and we feel sure they will do all in their power to promote the passage of the company's charter, and to otherwise aid them in the important work." In many other places these railways are talked about. In his communication above referred to Mr. Mackelcan says:

"I would like to caution those who may patronize or push forward this new system, against making things too great and too grand, under plea of suiting the future, for in this way the present and the future are both destroyed. That which will help Canada to grow into a thickly peopled, well cultivated, and prosperous country, is a net work of cheap conveyance, created in the country by its own industry and with its own capital, and costing so little as to pay for itself in a few years."

The estimated cost of such roads is from $4,000 to $5,000 per mile, which seems to us to be ample. We are inclined to think much more favorably of these practical ideas than the visionary project of a British American Inter-oceanic Railway, alluded to by us in a former number. We hope the plan may be well tested, and feel quite confident it will ultimately succeed.

Analysis of Lava.

M. Silvestri's analysis of the lava recently thrown out from Vesuvius shows that it closely resembles common wine-bottle glass. A considerable variety appears to prevail, however, in the constitution of lava, not merely when we compare specimens which have come from different vents, but when the comparison is instituted between masses of lava poured forth from the same vent at different epochs. The lavas which flowed from Vesuvius before the mountain had fallen into the state of quiescence described by Strabo contain disseminated crystals of leucite, a mineral which is very rarely found in the modern lava from this vent. And in general the latter are less crystalline than the old forms of lava. Indeed, the old lavas which flowed from Vesuvius (or Somna, as the ancient volcano was named) indicate a decided tendency to a columnar structure, corresponding to what is seen in the Giant's Causeway, the Isle of Staffa, and elsewhere.

It is a remarkable fact that the lavas of Vesuvius contain a greater variety of minerals than, perhaps, any others in the world. Hauy mentions that out of three hundred and eighty simple minerals known to him, no less than eighty-two have been found on Vesuvius; and of these several are peculiar to the locality. Sir Charles Lyell expresses the opinion that these have not been thrown up in fragments from some older formation, through which the gaseous explosions have burst, but have been sublimed in the crevices of lava, "just as several new earthy and metallic compounds are known to have been procured by *fumeroles* since the eruption of 1822."

A Huge Mud Digger.

An Eastern exchange says: The largest mud excavator in the United States has just been completed in Portland for a Boston party to be used in excavating the South Boston flats. The digger is eighty feet long and forty feet wide. It has double dredger with twenty-nine large iron buckets on each elevator. The elevators are placed on the sides of the scow and can be worked singly or together. Its operation is as follows: Two large scows are anchored ahead and astern of the digger, about 200 feet apart. These scows are secured by timbers that are driven into the mud, and raised, when necessary, by machinery. Two chains run through the digger and are attached to the anchored scows. When the engines are in operation they move a shovel, which is held in position under the dredger by an arm, one of these shovels being attached to the lower end of each elevator. As the dredger moves along between the two anchored scows, the shovels stir up the mud and the buckets on the elevator scoop it up and deposit it in a scow secured to the forward part of the dredge. The elevator runs by two engines, with cylinders six by eight inches, acting independent of each other. There are two main engines for running the machinery and moving the dredger, with cylinders fourteen by twenty inches.

Saving Trees Girdled by Mice.

At the February meeting of the Northern Illinois Horticultural Society, D. B. Weir, of Lacon, read a paper "On Saving Girdled Fruit Trees." He said he had over a hundred trees, seven years planted, completely girdled by mice. There had been for some time a heavy snow on the ground; and mice being plenty and in a starving condition, with nothing else to eat, they ate all the bark from the trees as far as they could reach; some of them for a foot up and down all around; and portions of the sap wood in some places half an inch deep. As soon as the damage was discovered, which was on the first thawing days, he banked the snow around the trees, and as soon as the soil thawed he banked that a foot high about the trunks.

This was all the attention they received; and to-day they have all the damaged parts covered by almost as thick a coating of bark as the uninjured portion of the trees. When the girdling is done high up on the trees, banking with soil will be impracticable. If the wounded parts are too high to reach by banking, clay may be bound on with a bandage. The sooner the surface is protected after injury the better. The death of the tree is caused by the seasoning of the sap-wood.

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Ornamental Majolica Flower Vases.

Ceramic art is probably older than that of the working of metals; for, while the possession of iron and a knowledge of its uses is assumed to be conclusive evidence of the elevation of a people above the condition of savages, and a proof of their partial civilization, at least, the art of forming utensils and ornaments from clay and baking them to resist the action of the atmosphere and exposure to the weather, is one that the very lowest tribes of the race possess in a measure. Yet while this art is common alike to the savage and civilized conditions of society, only the latter are capable of producing works in plastic materials which charm the eye with their their grace of form and elegance of ornamentation. Grecian art is as perfectly preserved and as worthily represented in the vases, urns, lamps, and other specimens of the skill of the ceramic artist as in the statues and architectural monuments that indisputably prove a high degree of refinement. Although we, to a certain degree, copy the antique in outline, yet taste, and art, and skill in these days are not a whit behind those of the Greeks. In some respects we excel them. This is seen in such products as those we represent in the accompanying engravings, which we copy from *The Workshop*, a monthly, edited by Prof. W. Baumer, I. Schnorr, and others, and published by E. Steiger, 17 North William st., this city. A notice of No. 10 of this monthly appears in another column. We cordially commend the periodical to workmen and manufacturers in every department of art.

The tallest vase in the engravings has a greenish gray tint, glazed, the leaves and violets retaining their natural color and relieved by a dark blue ground on the medallion and bands upon which they rest. The handles are of a yellow, graduating into green towards the lower parts.

The ground of the other is dark blue, glazed, the heads gray, the handles yellow, changing to a reddish tint at the upper parts, and to green at the lower parts. The leaves and flowers of the lily of the valley are of the natural colors.

Grace of form, brilliancy of color, and appropriateness of ornament combine to give peculiar beauty to these specimens.

DESIGNS FOR FLOWER VASES.

Scientific Progress.

Dr. J. Aitken Meigs concluded his inaugural address to the students of Jefferson Medical College with the following eloquent passage:

"A retrospective glance at the scientific progress of the last two hundred and seventy years shows us clearly that the glory of the seventeenth century was the development of the doctrine of universal gravitation and the establishment of the science of astronomy—a science treating of the motions and mutual relations of masses of matter; that the glory of the eighteenth century was the development of physics and chemistry, or those sciences which deal with the relations and reactions of atoms of matter; and that thus far the office of the nineteenth century, owing to the wonderful perfection to which the microscope and other instruments have been brought, has been the discovery of many of the laws upon which the mysterious phenomena of life depend. The great advance of our knowledge in histological and morphological development since the beginning of the present century, coupled with the new doctrine of the forces, has given rise to the growing conviction in the minds of physiologists that we are upon the eve of some great discovery in Biology, which will prove, in the hands of future physiologists, as powerful a means of research as has already been in those of the chemist, the law announced by Kirchoff in 1859, relative to spectral analysis. It may be that this discovery is to be reserved as the crowning glory of the coming century; it may happen, on the contrary, that some busy and ambitious brain, even now within hearing of my voice, is destined to grasp, in all their details, the facts at present in our possession, add to them still others, and suddenly, before the present century has run its course, utter to the world the formula by which they are colligated, and which expresses their true significance. In the present state of scientific progress and unrest who can tell?"

How to Practice with the Velocipede.

London Society gives from the pen of a skillful amateur the following directions for beginners with the velocipede:

Run beside your iron horse, leading it, as it were, with your hand, so as to familiarize yourself with its movements; this will be an affair of a few minutes merely. Then commence practicing with it on a slope, and, after mounting it, let it move forward of its own accord, while you occupy yourself with studying the effects produced by the inclination which you give to the balancing pole or handle of the machine. When you thoroughly understand the action of this, place one foot on the pedal, and follow its movements without assisting them. The difficulty with beginners is to restrain the unnecessary expenditure of muscular force; they ordinarily perform ten times the labor that is requisite.

Next repeat the experiment on level ground, having both feet on the pedals, and working them alternately with scrupulous regularity. Speed is obtained by simply accelerating this movement.

After an hour or two's practice the tyro will be able to accomplish a distance of from thirty to forty yards without running the risk of an upset. Should the machine incline on one side, all that is necessary to be done is to remove the foot on same side from the pedal and place it on the ground. This can of course only be accomplished when the velocipede is of a moderate height, which, by the way, is the proper kind of machine for beginners to make their first essays with.

To alight, both feet are raised from the pedals at the same instant, which has the effect of slackening the speed of the machine; the feet are then placed simultaneously on the ground without the handle being let go.

The tricycle, or three-wheeled velocipede, is easier to guide and safer to use than the bicycle; its speed is, however, less rapid; still, it can be made to pass a carriage going at full trot. As the fair sex largely patronize this vehicle, the seat is more commodious than that of the bicycle, having sides and back of wicker, and a horse-hair cushion to sit upon. The hind wheels, though large, are light, and revolve with facility; the fore-wheel, which is smaller, serves to guide the machine, being acted on by means of the handle, which causes it instantly to turn in the direction indicated by the rider. The pedals are shaped like slippers, which facilitates the movements of the legs, and at the same time admits of the foot being disengaged instantaneously. The movement required to impel the machine is a perfectly natural one, analogous, in fact, to that of walking, that is to say, without the slightest pressure of the foot, and certainly without producing any unusual fatigue, for the motion of the leg develops itself, as it were, until the limb becomes fully extended, entirely without effort.

In addition to all these advantages, the larger three-wheel velocipedes have a lever which follows the line of the eccentrics attached to the pedals and fits on to the axles. By assisting the movements of this lever, the speed of the vehicle is considerably increased, and a simple pressure against it checks the rotatory movement of the wheel and stops the progress of the machine. This lever is, in fact, both a means of impulsion and a break.

Hydro-Carbons for Generating Steam.

The London *Artizan* notices some experiments in utilizing liquid hydro-carbons as a heat-producing power, applicable to the generation of steam. It is known as the Dorsett plan, and instead of consuming the liquid, raises it to a vapor at such a heat as to sustain a pressure of from 30 lbs. to 40 lbs. The grand trial was made on a screw steamer, the *Retriever*, of 90-H.P., and 500 tuns. The engines of the usual overhead or "steam hammer" plan, cylinder 30 in. diam., and 24-inch stroke. The *Artizan* says:

"In applying this system to the *Retriever* everything has been done in a rough and ready manner. A couple of old upright boilers, one about three feet, and the other about two feet six inches diameter, have been pressed into the service and placed on the deck, from which the vapor was conveyed to the furnaces of the steam boiler, by means of one inch unclothed wrought iron pipes. All the firebars were removed from the furnaces and replaced by the layers of perforated firebrick. The boiler of the *Retriever* has three furnaces, in each of which at about the same hight as the fire bars would have been, was placed a double oblong coil of wrought iron pipe; the shape of the coil being somewhat similar to the outline of the plan of the furnaces, only smaller, so that the pipe was from one to two inches distance from the sides of the furnace. The lower of the two coils was perforated by four small holes, or jets, about 3-16th inch diameter; namely, one at each side, and one at each end of the coil. The vapor was caused to pass first through the upper coil of pipe, and thence to the lower, by which means a considerable additional amount of heat was imparted to it just before issuing from the jets. The doors and ash-pits of the furnaces were fitted with perforated plates by which the amount of air could be regulated. The boiler, which is on the usual return tube plan, has eight rows of tubes, but the four upper rows were stopped. At first starting coal is used in the furnaces of the generator, which are about three fourths filled with creosote. As soon as the vapor of the creosote is raised to about to five pounds pressure, it is admitted by means of a small pipe which runs down from the top of the generator into the furnace beneath it, when from that time no more coals are used, as the vapor issuing from a small jet in the furnance performs the required duty. The most advantageous pressure at which the creosote vapor should be used appears as yet to be scarcely determined; in this case it was used at from thirty pounds to forty pounds for the steam boiler

"A very interesting trial of this system was made on the 12th ult., when the *Retriever* ran from Deptford to a short way below Gravesend and back, a distance of somewhat over fifty miles, without the slightest hitch of any kind. The steam was kept up at the working pressure of fifteen pounds, dur-

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ing the whole time, and with one exception, which was purely the result of carelessness, and which only lasted about a minute, the smoke was scarcely perceptible during the entire journey, and it was evident that this minute quantity was entirely owing to the temporary nature of the arrangements for regulating the admission of air to the furnaces. As regards the merits of this system over coal burning, we cannot venture to offer a decided opinion without more accurate data than can at present be obtained. It was stated that the average consumption of creosote during the trip was thirty-five gallons, while the usual consumption of coals was eight hundred. As the present present price of creosote is less than one penny a gallon, this shows a large direct saving, to which must be added the great saving effected by entirely dispensing with stokers, and the increased carrying capacity of the vessel.

"We believe that this is the first thoroughly practical exhibition of the merits of liquid fuel for steam navigation, and it has certainly, so far, proved a success, as to justify perfecting the various mechanical details, and giving the system a fair trial."

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Water and Wind Power at the West.

MESSES. EDITORS:—The Commissioners of Maine exhibit an immense grand total of water power, which the young state of Nebraska can leave far in the shade with a species of power she possesses, and which is susceptible of development to an almost unlimited extent.

Unfortunately this State, "so far as heard from," is not abundantly supplied with fuel for steam and our streams are not well located for manufacturing purposes.

Fuel here will necessarily be dear until our *planted* forests have time for growth or cheap transportation can bring us coals from the rich mines of our mountains west.

We have no lack of wind force, which can be put to turning our wheels as it passes over our broad plains.

Wind mills are now constructed so as to govern themselves to a regularity of speed, between a good running wind and a gale, not surpassed by the operation of the steam governor. With such mills pumping can be done at no expense of power, and no cost except oil and a few minutes' attention each day to apply the lubricator.

The Union Pacific Railroad Company are now better served with water at their large shops in this city, by a windmill, at nominally no expense, than they were one year ago by steam at a running expense of about fifteen dollars per day. This mill is but partially self-regulating and cost about one-half as much as did the engine.

For grinding grain, and in fact for all machine work which can be done without much attention and hand labor, wind power is both practicable and profitable; but where artisans are employed it is important that the *time* of running should be controlled, and my object in writing is to call inventors to this point. Give us a plan that will "bottle up" power to be used as we see proper.

In good situations here a wind mill will run upon an average of fifteen hours per day of twenty-four hours during the year. Elevating water to drive machinery is objectional from its scarcity, great evaporation, and expense of reservoirs. Concentration of *air* is only limited in capacity by the strength of machinery and power used, and in it we may possibly find the proper element.

Of course when wind is "in season" machinery should be driven by it *direct*, thus avoiding the loss by friction, leakage, etc. Your correspondent who discussed utilizing the sun's power, would find himself far in the rear if he should attempt a race with some of our "gentle zephyrs."

While Holland is kept above water by very rude windmills, why not use our ingenious Yankee devices to float us upon the tide of commercial prosperity? G.

Omaha, Nebraska, Nov. 16, 1868.

Smoke Wreaths.

MESSRS. EDITORS:—In answering J. M. D., of Mass. (see answers to correspondents in No. 20), you do not assign any reason for the formation of wreaths of smoke. Now as I have often asked myself the reason, and taken pains to ascertain the cause, I think that I have succeeded in arriving at a conclusion that would stand the test of experimental research. I will add that I have never heard any reason assigned for it, but have experimented solely with the view of satisfying myself (and in that at least have been successful), and the theory that I have formed is this, viz.:

In order to form a wreath of smoke, there must be another gaseous or aeriform body in contact with the smoke as it issues from the tube. Smoke, especially if "fat" or damp, has an attraction to the walls of the chamber through which it is passing or in which it is confined, unless continually kept moving by a current or blast of air. Now in the smoke stack of a locomotive at rest, the smoke gathers around the sides; a volume of steam from the exhaust forced through the stack with considerable violence has not sufficient time to expand enough to drive out all the smoke ahead of it, but remains more compact and forces its way through the center of the smoke in the shape of a cylinder, dragging out at the same time a certain amount of smoke (by the force of attrition or friction), which smoke, impinging on the external air, is at one blow literally hammered or pressed down to the shape of a nimbus or wreath.

This is my theory of the formation of the smoke wreath, whether from the smoke stack, the cannon, or the human mouth. C. H. DAVIDS.

Brooklyn, N. Y

Something for Watch and Clock Makers.

MESSRS. EDITORS:—I am a practical watchmaker—or as near it as Americans often arrive—have had fifteen years' experience and have always found more or less trouble with the pivots becoming rusty and stopping the watch, particularly in English lever and American watches; also on the staff of marine clocks. Many times I have cleaned a watch or marine clock and oiled with the best oil I could get (Ezra Kelly & Son's oil), and they would run from three to eight weeks and sometimes longer, and then refuse to go without any apparent cause. I would take them down and find in watches, generally, the lower center bearing under the canon pinion corroded or rusted, so tightly that it would be difficult to remove the wheel from the plate. This occurs on all pivots, but more generally on this than any other pivot or bearing; oftener on the large than the small pivots and on the staff in marine clocks than in watches.

The corrosive substance is sometimes nearly black, but generally of a red hue like crocus, which it appears to resemble, having the same properties in its action on steel; for in every case the pivot is cut and sometimes ruined, even when it is so hard that a file will not touch it. I used to think the fault was with the oil, but by changing the oil used I could find no advantage.

I have talked with a great many watchmakers and found them as much in the fog as myself. Some attribute the difficulty to the action of the atmosphere but can give neither reason nor remedy. D. E. C.

Traverse City, Mich.

Estimation of Size Comparative.

MESSRS. EDITORS:—The extract from the Boston *Journal of Chemistry* concerning our knowledge of magnitudes being obtained only by comparison, which appeared in the SCIENTIFIC AMERICAN of Nov. 4th, is pleasingly confirmed by the following experience: Several years ago, after experiencing for seven weeks the severe monotony of the ocean-like levelness of the plains, on arriving at the Rocky Mountains and winding among the "foot hills," the hills seemed mountains, the slopes precipitous, the valleys gorges, and the roads narrow and of dangerous inclination. One year and a half elapsed before we returned to the plains. In the meantime we had crossed and recrossed the range and stood upon the loftiest peaks of the Sierra Madre. As we returned to the "plains" and recalled the localities which were impressed upon our minds, it was with the greatest difficulty that we could recognize them, they were so changed, for the hills were but mole hills instead of mountains, the slopes were not precipitous, the valleys were not simply passes, and the roads were not narrow or steep. Our first impressions were annihilated and our feelings entertained must be experienced, language cannot express them. At first they were compared with the plains we had just crossed. Now they are compared with the lofty peaks and surroundings of the Snowy Range, thus showing in a pleasing and instructive manner "that our conception of magnitude is comparative." G. E. M.

Georgetown, Cal.

OFFICIAL REPORT OF PATENTS AND CLAIMS

Issued by the United States Patent Office

FOR THE WEEK ENDING NOVEMBER 24, 1868.

Reported Officially for the Scientific American.

PATENTS ARE GRANTED FOR SEVENTEEN YEARS, the following being a schedule of fees:—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filing application for Design (seven years)	$15
On filing application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

☞ *Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required, and much other information useful to Inventors, may be had gratis by addressing MUNN & CO., Publishers of the Scientific American, New York.*

84,247.—PLANTING MACHINE.—Samuel L. Allen, Cinnaminson, N. J.

84,248.—SWAGING ATTACHMENT FOR SHEET METAL WORKING MACHINES.—Henry E. Anderson, Ripon, Wis.

84,249.—STEAM ENGINE.—Earle C. Bacon, New York city.

84,250.—MANUFACTURE OF CARBONATE OF SODA.—Haydn M. Baker, New York city.

84,251.—STEAM PUMP.—John S. Barden, Providence, R. I., assignor to himself and Daniel N. Pickering, Boston, Mass.

84,252.—PLOW.—Edward D. Benjamin, Old Town, Ill.

84,253.—LET-OFF MECHANISM FOR LOOMS.—Thomas Booth and Chas. C. Sanderson, Norway, Me.

84,254.—HORSE RAKE.—L. S. Bortree, Grand Rapids, Mich.

84,255.—BANDAGE FOR PRETERNATURAL ENLARGEMENTS.—Anson R. Brown, M. D., Albion, Mich.

84,256.—HINGE MACHINE.—Edward Brown, New York city.

84,257.—HAY SPREADER.—Geo. E. Burt and Edwin A. Hildreth, Harvard, Mass.

84,258.—CAR SPRING.—E. T. Bussell, Indianapolis, Ind.

84,259.—METHOD OF GENERATING FIXED GASES FROM HYDROCARBON VAPORS.—John Butler, Brooklyn, N. Y.

84,260.—STEP LADDER.—Joseph Charleville, St. Louis Co., Mo.

84,261.—SPINNING WHEEL.—Chas. L. Cole (assignor to himself and Thomas Johnson), Richmond, Mich.

84,262.—WATER CLOSET.—H. H. Craigie, New York city.

84,263.—MANUFACTURE OF PAPER BELTING.—Jas. B. Crane, Dalton, Mass.

84,264.—DIVIDED AXLE FOR RAILWAYS.—Daniel M. Cummings, Wyman Pattee, and Albert M. Shaw, Enfield, N. H.

84,265.—THILL COUPLING.—Wm. H. Curtiss, Panesville, Ohio

84,266.—DEVICE FOR HANGING PICTURE AND OTHER FRAMES. Chas. B. Davies, Dayton, Ohio.

84,267.—CLOG.—Job A. Davis, Watertown, N. Y.

84,268.—HOD ELEVATOR.—Paul Dehlinger, Buffalo, N. Y.

84,269.—HORSE HAY FORK.—Wm. E. Derrick, Jordan, N. Y.

84,270.—REFLECTOR FOR PUBLIC HALLS, ETC.—Ossian E. Dodge, St. Paul, Minn.

84,271.—HORSE HAY FORK.—Geo. H. Dow, Feeport, Ill.

84,272.—COMPOSITION FOR PAVEMENTS.—Gustave Dubelle, Boston, Mass.

84,273.—TYPE SETTING MACHINE.—F. G. Foster, Eagle Rock, N. C.

84,274.—PUMP.—Earl J. Hall (assignor to himself and Jacob Eldridge), Indianapolis, Ind.

84,275.—CENTRE BOARD WENCH.—Everett C. Hammond, (assignor to himself, O. H. Pennock, and Ira G. W. Pennock), Oswego, N. Y.

84,276.—FAN.—Anne B. Hancock, Suspension Bridge, N. Y.

84,277.—EVAPORATOR.—James Harris, Janesville, Wis.

84,278.—BALANCE SLIDE VALVE.—Thomas M. Herriott and Samuel M. Meyers, South Pittsburg, Pa.

84,279.—MOLDING MACHINERY.—William T. Horrobin, Bennington, Vt.

84,280.—ROTARY STEAM ENGINE.—Charles Kaiser, New York city.

84,281.—CLOTH MEASURING APPARATUS.—R. H. Kent, Middlebury, Ohio.

84,282.—WATER ELEVATOR.—Chester King, East Cleveland, Ohio.

84,283.—PORTABLE GAS APPARATUS.—George H. Kitchen, New York, and Scotto C. Nash, Brooklyn, N. Y.

84,284.—BRICK MACHINE.—J. Klinkhardt and W. Kiburz, (assignors to themselves and Paul Oehler), St. Louis, Mo.

84,285.—LIFTING JACK.—Francis Krick, Fidelity, Ohio, assignor to himself and Eli Sinks.

84,286.—BEE HIVE.—J. C. Lander and R. R. Lander, Manie, Wis.

84,287.—COTTON GIN.—Charles Leavitt and W. H. Burridge, Cleveland, Ohio.

84,288.—BRIDGE.—J. H. Linville, Philadelphia, Pa.

84,289.—MODE OF PACKING LAMP SHADES.—Edward A. Locke and William N. Weeden, Boston, Mass.

84,290.—CLOTH MEASURING APPARATUS.—Samuel B. Luckett, Corydon, Ind.

84,291.—ANIMAL TRAP.—Harmon F. Lushbaugh and Oscar Z. Hurd, Mount Pulaski, Ill.

84,292.—WATER WHEEL.—Theodore W. Mahler, Rome, N. Y. Antedated November 9, 1868.

84,293.—WATER ELEVATOR.—Cornelius W. L. Martine, Scotch Plains, N. J.

84,294.—HORSE SHOE.—Samuel Mason, Newark, N. J.

84,295.—SAFETY STOVE FOR RAILROAD CARS.—William C. McGill and William Knox, Cincinnati, Ohio.

84,296.—SEEDING MACHINE.—Lynfred Mood, (assignor to Titus and Bostwick), Ithaca, N. Y.

84,297.—POTATO DIGGER.—F. A. Morley, Syracuse, N. Y.

84,298.—WATER INDICATOR FOR STEAM BOILERS.—Adolphus F. W. Neynaber, Philadelphia, Pa.

84,299.—MODE OF POLING HOPS.—Garret J. Olendorf, Middlefield, N. Y.

84,300.—SPRING BED BOTTOM.—Henry H. Palmer, Rockford, Ill.

84,301.—MACHINE FOR PRODUCING WEAVER'S CUT MARKS.—William G. Perry, Manchester, N. H.

84,302.—SAP SPILE.—Charles C. Post, Hinesburg, Vt.

84,303.—DEVICE FOR PREVENTING HENS FROM SCRATCHING.—Eli Rice, West Northfield, (assignor to himself and N. H. Richardson), Fitchburg, Mass.

84,304.—ANCHOR.—Carl Wilhelm Roeden, San Francisco, Cal.

84,305.—MOLDING GEAR WHEELS.—Warren Rowell, (assignor to himself and John Heck), New York city.

84,306.—PAPER CUTTING MACHINE.—George H. Sanborn, New York city.

84,307.—PAPER CUTTING MACHINE.—George H. Sanborn, New York city.

84,308.—CAR HEATING STOVE.—Ethiel Sanger, Alton, Ill.

84,309.—POTATO PLANTER.—Norman B. Sherwood, Millville, N. Y.

84,310.—SLEIGH AND BABY CARRIAGE.—Louis Shmetzer, Chicago, Ill.

84,311.—RING-FERRULING MACHINE.—John Siddons, Rochester, N. Y. Antedated November 7, 1868.

84,312.—RAILROAD CAR STOVE.—James Spear, Philadelphia, Pa.

84,313.—ADJUSTABLE PRESS.—Norman C. Stiles, Middletown, Conn.

84,314.—GUN LOCK.—John Stokes (assignor to Wesson Fire-Arms Company), Springfield, Mass.

84,315.—HORSE RAKE.—O. O. Storle and Lorens Swenson, Norway, Wis.

84,316.—CARRIAGE SPRING.—A. C. Stowe, San Jose, Cal.

84,317.—STRAW CUTTER.—Edward Strothman and John Strothman, Milwaukee, Wis.

83,318.—IRON FENCE.—Andrew Terry, Waterbury, Conn.

84,319.—CAR-WINDOW VENTILATOR.—Wm. Thompson, Dublin, Ireland. Patented in England Nov. 11, 1867.

84,320.—BOILER-TUBE SCRAPER.—Charles W. Tremain, Chicago, Ill.

84,321.—ADJUSTABLE FLOODGATE.—Newell Tupper, Grand Blanc, Mich.

84,322.—COMPOUND FOR TREATING RINGBONE, SPAVIN, ETC., in Horses.—W. H. Vance, Corydon, Ind.

83,323.—HAT VENTILATOR.—William F. Warburton, Philadelphia, Pa.

84,324.—CANE AND WILLOW STRIPPER.—A. F. Ward and J. H. Bean, Marietta, Ohio.

84,325.—FELTED TUFTED FABRIC.—John T. Waring, Yonkers, N. Y.

84,326.—JOURNAL BEARING FOR RAILROAD CARS.—Isaac P. Wendell (assignor to Ebert J. Wendell), Philadelphia, Pa. Antedated May 25, 1868.

34,327.—PAINT BRUSH.—Darius White, Portland, Me.

84,328.—REIN HOLDER.—Chas. Whittaker, Milwaukee, Wis

84,329.—METHOD OF INSERTING INDIA-RUBBER IN HUBS OF Carriages.—G. F. Wilson, East Providence, R. I.

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84,332.—APPARATUS FOR CARBURETING AIR.—J. S. Wood, Philadelphia, Pa.

84,333.—APPARATUS FOR REFINING IRON AND MAKING Steel.—John Absterdam, New York city.

84,334.—PROCESS FOR REFINING IRON AND MAKING STEEL.—John Absterdam, New York city.

84,335.—APPARATUS FOR MAKING STEEL AND REFINING Iron.—John Absterdam, New York city.

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84,356.—HOT AIR FURNACE.—S. J. Hare, Louisville, Ky.

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84,400.—ICE SPUR.—C. F. Wieland, Darmstadt, Ill.

84,401.—RAILWAY RAIL.—Henry Zahn, Toledo, Ohio

84,402.—BOOT CRIMPER.—Oliver M. Adams, Milford, Mass.

84,403.—PRINTING PRESS.—Samuel J. Baird, Staunton, Va.

84,404.—PROCESS OF RECOVERING PIGMENTS, OILS, AND GUMSFROM CLOTHS USED BY ENGRAVERS.—Haydn M. Baker, New York city. Antedated November 7, 1868.

84,405.—OIL CAN.—B. F. Barnes, Boston, Mass.

84,406.—LAMP BURNER.—Alfred Bliss, New York city.

84,407.—GAGE FOR MORTISING WINDOW SASH.—W. P. Boyd, Thorntown, Ind.

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84,419.—CORN HUSKER, SHELLER, AND STRIPPER.—Friedrich Häfelfinger and Robert N. Eagle, Washington, D. C.

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84,423.—LOOM.—Barton H. Jenks, Bridesburg, Pa.

84,424.—REELING MACHINERY.—Barton H. Jenks, Bridesburg, Pa. Antedated November 14, 1868.

84,425.—STEAM ENGINE WATER HEATER.—William Ashley Jones, Dubuque, Iowa, and James L. Sherman, Cassville, Wis.

84,426.—CORN PLANTER.—C. A. Kellogg, Elyria, Ohio.

84,427.—STEAM GENERATOR.—John C. Kilgore, Philadelphia, Pa,

84,428.—BLOWING ENGINE.—Alexander Carnegie Kirk, Glasgow, Great Britain.

84,429.—SAD-IRON HEATER.—David H. Lowe, Boston, Mass.

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84,431.—DISH-WASHER.—Charles Messenger, Cleveland, Ohio.

84,432.—HARVESTER.—Lewis Miller, Akron, Ohio.

84,433.—MACHINE FOR MAKING HARVESTER-GUARD FINGERS.—Lewis Miller, Akron, Ohio.

84,434.—WINDLASS AND HORSE-POWER.—Simon B. Minnich, Landisville, Pa.

48,435.—HAND CORN PLANTER.—John H. Morris and Thos. B. Harrison, Maquoketa, Iowa. Antedated Nov. 18, 1868.

84,436.—ELEVATOR AND CONVEYER.—Lewis Y. Myers (assignor to himself and Emanuel Raber), Roanoke, Ind.

84,437.—CORN AND POTATO-PLOW.—Walter Notman, Deerfield, Ohio.

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84,439.—BEER-COOLER.—A. D. Puffer, Somerville, Mass.

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84,447.—PNEUMATIC STREET RAILWAY CAR.—C. W. Wailey (assignor to New Orleans Pneumatic Propelling Company), New Orleans La.

84,448.—CURTAIN CLASP.—B. F. Watson and Albert Shepard, Bridgeport, Ill.

84,449—CULTIVATOR.—Seth Way, La Porte, Ind.

84,450.—SAFETY HORSE HITCH.—Theophilus Weaver, Harrisburg, Pa. Antedated September 22, 1868.

84,451.—MECHANICAL MOVEMENT.—Milo Webb, Chenango Forks, N. Y.

84,452.—DUNG DRAG AND HOOK.—Henry W. Weiss, Quakertown, Pa.

84,453.—COVER FOR HAY AND GRAIN COCKS.—E. R. Whitney, Plattsburg, N. Y.

84,454.—HEMMER FOR SEWING MACHINE.—Elihu Wilder, and John Crandell, Chicopee, Mass.

84,455.—MANUFACTURE OF ALCOHOLIC SPIRITS FROM TOMAtoes.—Joseph S. Williams, Cinnaminson, N. J.

84,456.—COFFEE POT.—William M. Williams, St. Louis, Mo.

84,457.—UMBRELLA.—George L. Witsil, Philadelphia, Pa.

84,458.—CONSTRUCTION OF ICE PITCHERS.—Wm. C Wood, Washington, D. C.

84,459.—BREECH-LOADING FIRE-ARM.—Andrew Wyley, Birmingham, England. Patented in England, March 25, 1867.

84,460.—GAS MACHINE.—E. Hall Covel and William H. Covel, New York city.

84,461.—TOY TARGET.—G. F. Fessenden, Arlington, Mass.

84,462.—HORSESHOE.—Wm. C. Whitmore, Macon City, Mo., assignor to Abijah Richardson, Boston, Mass.

REISSUES.

70,447.—BLAST FURNACE.—Dated Nov. 5, 1867; reissue 3,204.—George Asmus, New York city, assignee of F. W. Lürmann.

82,082.—CARRIAGE SPRING.—Dated September 15, 1868; reissue 3,205—Azro Buzzell, West Fairlee, Vt.

48,495.—GRAIN ELEVATOR.—Dated June 27, 1865; antedated June 12, 1865; reissue 3,206—Lewis S. Chichester, George H. Nichols, and Clark W. Mills, Brooklyn, N. Y., assignees, by mesne assignments, of Francis Taggart, Lewis S. Chichester, and Clark W. Mills.

79,553.—VELOCIPEDE.—Dated July 7, 1868; reissue 3,207—Benjamin P. Crandall, New York. N. Y.

79,674.—WOODEN PAVEMENT.—Dated July 7, 1868; reissue 3,208—Duncan McKenzie, Brooklyn, N. Y.

76,510.—MACHINE FOR THE MANUFACTURE OF GUNPOWDER.—Dated April 7, 1868; reissue 3,209—Paul A. Oliver, New York city.

21,034.—SEED PLANTER.—Dated July 27, 1858; reissue 3,210—J. H. Thomas and P. P. Mast, Springfield, Ohio.

30,045.—BREECH-LOADING CANNON.—Dated September 18, 1860; reissue 3,211.—Charles F. Brown, Warren, R. I.

64,663.—FLOAT VALVE.—Dated May 14, 1867; reissue 3,212.—J. H. Guild, Rupert, Vt.

30,010.—HORSE RAKE.—Dated September 11, 1860; reissue 3,213.—Daniel Strock, Chambersburg, Pa.

12,233.—SEWING MACHINE.—Dated January 16,1855; reissue 3,214.—Jotham S. Conant Hackensack, N. J., assignee, by mesne assignments, of himself.

22,990.—MOP HEAD.—Dated February 15, 1859; reissue 3,192, dated November 10, 1868; reissue 3,215.—Luke Taylor, Springfield, Vt.

DESIGNS.

3,263.—CHAIR SEAT BOW.—Henry C. Knowlton, Gardner, Mass.

3,264.—TRADE MARK.—B. B. Wilcox, New Haven, assignor to J. W. Nash, Madison, Conn.

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